18.2.2.1 VZ

## F. AK-WA SHIPBUILDING EPA Region 10 Deemed Releasable 1/20/2021

## : 1). INTRODUCTION

## a) Site Description and History

## CONFIDENTIAL

The AK-WA ship repair facility had two 500-foot long piers and approximately four acres of adjoining yards and shop area (2936). This property was rented on a permanent basis from the Port of Tacoma (2936). The four acres consisted of 2.3 acres of land and 1.7 acres of dry dock and piers (2926). Another 4.6-acre inland property was leased from the Port of Tacoma on a temporary basis as a main operation base (2936). It was scheduled to be returned to the Port in late 1989 (2936).

The Main Yard Facility was located directly on Commencement Bay shoreline between the Blair and the Hylebos Waterways, but not directly on either one (2936). The address of the site, 401 Alexander Avenue, covers the entire complex owned by the Port of Tacoma, which includes numerous land and building sites (2936). Other facilities included the major plate and fabrication areas, marine construction, warehouse, paint storage and offices within Building #588, outfitting docks, grit blasting and paint spray areas and lumber storage areas (2986).

Todd Shipyards originally developed the property in 1917 for the production of ships during World War I (2840). It provided ship building and dismantling through the end of World War II (2840). It was described at one time as the largest shipyard in the America (2840).

Zidell Marine leased 7.4 acres of land, docks and waterway at the site from 1960 until 1985 for dismantling operations (2840). Zidell had NPDES permits to discharge its treated ship dismantling wastewater to the Hylebos. There were seven documented oil spills or other permit violations at the site between 1969 and 1975 (PRC, 1993). Another source of contamination from the site during this company's lease was from its use of ballast composed of gravel and rock stabilized with waste oil (PRC, 1993).

Joseph Simon & Sons leased part of the property from 1975 to 1980 (PRC, 1993). Tacoma Boat Building Company leased a portion of the property between 1969 and 1987 (2840). The site has been used for over 70 years for manufacturing, construction, ship repair, new ship construction, and ship dismantling (2936). Other companies that have been named as tenants of the site include the Pacific Marine Repair, Marine Industries, Coast Engines, and Kiewit Construction (2840). AK-WA Shipbuilding began leasing the site from the Port of Tacoma in November, 1986 (PRC, 1993).

Stormwater runoff from the site was contaminated by its contact with a number of pollutants in materials that were deposited on the ground (2986). Material that typically accumulate at shipyards include spent abrasive blasting grit, fresh anti-foulant and anti-corrosive paint overspray, various cleaners, solvents and anti-corrosive compounds, paint chips, scrap metal, welding rods, wood, plastic and miscellaneous solid waste (2786). During a 1991 inspection, the Port of Tacoma detected very high levels of copper, lead, zinc, and mercury in sandblast grit outside Building No. 588 (PRC, 1993). Stormwater samples that were collected from yard often contained high levels of copper, lead, zinc,



mercury and oil and grease, and once contained a number of VOCs. Sediment and grita that was removed from the stormwater catch basins lead, zinc, copper, and PCBs. Sether releases from the site include spills of diesel and oil.

## b) Recent Events

In March of 1995, AK-WA Inc. merged with Giannotti Marine Engineering, Inc. (2873, Attachment A). The surviving entity was known as the Giannotti Corporation, and AK-WA was then known as the AK-WA Shipyard division of the Giannotti Corporation (2873). AK-WA was sold to the California-based Giannotti Corporation in 1995 (2809). Ecology inspectors noted a significant deterioration in yard's environmental compliance after that point (2809). AK-WA won a significant number of Washington State Ferries vessel maintenance contracts in the 1990's (2808). AK-WA's lack of compliance with environmental laws puts its Prequalification Certification for WSF contracts in jeopardy (2808). On May 6, 1997, Washington State Ferries informed the Giannotti Corporation that they had rejected the company's bid for the M.V. Issaguah dry-docking Contract No. 00-5175. AK-WA had won the contract, but Todd Pacific Shipyards Corporation had protested the award of the contract based on the company's noncompliance with their NPDES permit (bidders are required by law to meet certain requirements, including being in compliance with environmental regulations) (2792). AK-WA had just received Penalty No. DE 97WQ-S148 on 04/14/97 in the amount of \$52,000 for not implementing the Best Management Practices (BMPs) (actions such as sweeping and covering materials) required by their NPDES permit and for permit violations for their stormwater outfalls in November and December of 1996 and January of 1997 (violations in limits for Oil and Grease and Total Suspended Solids (TSS)). The company was also not in compliance with the company's NPDES permit requirement that the company provide Ecology with an acceptable "All Known Available and Reasonable Treatment" (AKART) report (2792). The contract was later awarded to Todd Pacific Shipyards Corporation on May 9, 1997 and according to an Ecology letter written on July 8, 1997, AK-WA was out of business (2791 and 2788).

## 2). CHEMICALS ASSOCIATED WITH LAND-USE PRACTICES

#### a) Dry Dock Operations

AK-WA is a ship repair and steel fabrication business that typically serviced four

There was a complex chain of events surrounding the submittal of this report involving the Department of Ecology, AK-WA, the Washington Attorney General's Office, and a public interest law firm called the Atlantic States Legal Foundation. A detailed discussion of the facts surrounding the submittal of the AKART report was not included because it does not significantly contribute to an better understanding of AK-WA from a natural resource damage assessment perspective. More information about the report and discussion of the submittal requirements of the company's NPDES permit can be found in documents 2784, 2790, 2803, 2804, 2813, 2822, 2823, 2824, 2833, 2837, 2842, 2867, 2872, and 2879.

steel-hulled vessels each month and 80 vessel a year (2924, 2936 and 2986). It repaired, modified and performed major refurbishment of vessels between 100 and 400 feet in size (2936). Most of the AK-WA's work was performed "pier side" or in its wooden dry-dock which could handle vessels up to 10,000 tons (2936 and 2986). Dockside facilities allowed repair of vessel up to 1,000 feet in length (2786). Most of what the company didward steel-structural repairs, painting, mechanical repairs, equipment installation, piper modification and vessel outfitting (2936). Tasks such as refrigeration, tank and bilded cleaning engine overhauls and fiberglass installation were handled by subcontractors (2936). According to the company, it never handled vessel repairs in which hazardous material were present and it required vessel owners to have their vessel cleaned of any hazardous material and cargoes before entering the yard (2936).

AK-WA dry-dock was a wood floating sectional dock (2924). The dock was moored on the west side of Pier 25 and was composed of six independent sections that could be operated independently from the others (2924). The dry-dock floor was flush and sloped down toward the wing walls (2924). There were drains at each of the sections along the wing walls (2924). To determine the effects of dry dock activities on the water quality of the Hylebos, a water sampled was collected before and after undocking of vessels, with a background sample taken before undocking at the end of Pier 25 (2927).

AK-WA purchased its dry-dock in 1986 from the Department of Defense (3002). Marine Power & Equipment Co., Inc. was the original successful bidder for the purchase of the dry-dock, but refused to accept to buy it because it had been treated with arsenic to kill teredo worms (3002). The EPA had stated that the dry-dock was a potential source of pollutants (3001).

The primary source of pollutants from the shipping operation was metals released from entrained paint chips in spent sandblast grit that accumulated after sand blasting (2927). AK-WA was required to clean the dry dock before undocking, but the floor of the dry dock was deteriorated and there were many cracks that made it harder to clean before each undocking event (2838).

## i) Hydroblasting

Hydroblasting is the practice of treating materials with water under very high pressure (2924). AK-WA used it only to remove sea growth, salts and other surface contaminant from ship hulls, and it was not used to remove existing paint coatings (2924). It was occasionally used as a paint removal and hull preparation method, but was unacceptable for many vessels because of rust blooming (2927). It took between two and ten days to hydroblast a ship, and each ship created approximately 7,000 gallons of wastewater (2972). The primary contaminants were copper (up to 41,000 ppb Total Recoverable Copper) and zinc (13,000 ppb Total Recoverable Zinc). Before 1992, wastewater from the hydroblasting was discharged directly to the Hylebos (2972). In. August, 1992, AK-WA installed a Beckart 1,000-gallon package batch treatment plant to treat the effluent before it was discharged to the City of Tacoma sanitary sewer system; (2972).

AK-WA performed sandblasting and painting of ships (2936). All exterior sandblasting and painting was performed while the vessel were in dry-dock (2936). Used blast grit was originally stored in a designated collection site that was paved and contained with concrete blocks on three sites (2924). Sand blasting was conducted after vessels were low-pressure hydroblasted. This was done to strip paint off the hull before a new coat was applied or other repair work was conducted (2927). The sandblast grit consisted of copper-based slag (2927).

AK-WA handled a number of solvents and paints in this operation in quantities ranging from 5 to 55 gallon containers (2936). Substances used included (chemical character and annual quantity used in parentheses): zinc primers (zinc oxide, 1,000 gallons), epoxy paints (n-batsl, -alcohol and ketone, 5,500 gallons), enamel paints (mineral spirits, 3,200 gallons), anti-fouling paints (resins, oxides, and xylene, 2,200 gallons), ALKSD enamel paints (mineral spirits and toluene,), vinyl enamel (alcohol and acetates), resins (toluene), solvent #1 (xylene, alcohol, ketone, 600 gallons), methyl ethyl ketone (MEK) (2-butanone, 1,520 gallons), dry solvent (1,1,1-trichloroethane, 60 gallons), thinner 26-B (benzene petroleum dissolate,), T-11 thinner (toluene, alcohol, ketone), and T-10 thinner (2936).

Anti-fouling paints that were used at the yard included DEVOE Marine Coatings ABC #3 and International Paint Formula 121 (2924). Anti-corrosive paints used at the yard including International Paint KHA304 ITUF Epoxy, DEVOE Marine Coatings Devran 230 Epoxy, and DEVOE Marine Coatings Formula 150 Epoxy (2924). Waste paints were baked to remove all possible solvents to a dry powders, then the powder was stored in steel drums until sent for disposal by Sol-Pro (2924).

Blasting grit was delivered to the site by trucks into 6 to 40 ton storage tanks called blasting hoppers (2936). The plant used Kleen Blast (a copper smelling slag) and Safety Blast (a nickel slag abrasive) (2936). A 1989 report noted that the facility used 2,312,000 pounds of Kleen Blast and 1,000 pounds of Safety Blast (2936).

After AK-WA was sold to the Giannotti Corporation in 1995, the upkeep of the yard deteriorated and sandblast grit was seen "everywhere" by Ecology inspectors during unannounced inspection on 08/20/96 and 08/30/96 (2809 and 2850, see photos 2859). Up to one inch of sandblast grit was seen on 08/20/96 in the dry dock and a box next to the dry-dock which was used to hold spend sandblast grit was uncovered and according to the inspector, rainfall could have caused runoff to be contaminated with zinc and copper (2857). There were also empty paint containers that were stacked on top of other (2857). The inspector noted that residual paint would have been washed in a rain event into the Hylebos (2857).

On the 08/30/96 inspection, there was sandblast grit as deep as 8 inches on the floor of the wooden dry dock (2853). Ecology sent a letter to the company asking it to come in line with regulations, but a follow-up inspection in October 1996 showed no improvement (2809).

#### b) Oil and Fuels

The facility used a number of fuels and oil including dieseline (3,000 gallons), Rosella Oil-30, Spiray HD-80W/90, Lube Oil MIL-L-90006, Tellus Oil 32, and Super 30 (2936). The facility used a total of 6,000 gallons of lube oils, and 1,000 gallons of hydraulic oil (2936). Used oil and oily water was stored in a-2,500-gallon aboveground steel tank (2924). The United Drain Company recycled it 10 to 14 times a year (2924). Air compressors and heavy equipment were identified as potential sources of oil to the stormwater systems (2786).

AK-WA-had-two portable tanks for temporary oil storage (800 and 300 gallons capacity) and a permanent above-ground tank (2,000 gallon capacity) on a concrete slab next to Building 9588 (2825).

#### c) Other

AK-WA used a heavy degreaser that was manufactured by the Inland Chemical Company (2924). AK-WA noted on its NPDES Permit Application that antifreeze and coolants from general maintenance of company equipment was disposed of in the sewer system (2924, pg. 6).

## 3). SIGNIFICANT CONTAMINANT LINKS TO THE HYLEBOS

The entire AK-WA facility was paved and precipitation was collected into three stormwater drainage system (2986). These outfalls discharged to the Hylebos through Outfalls 002, 003, and 004. As of 1995, there were 12 catch basins, two of which were not functioning properly because the concrete bottoms of the catch basins no longer existed (2926). Surface water drainage in the yard and parking lot areas was accomplished through a network of catch basins located throughout the yard (2936). Each catch basin had an 18" deep collection reservoir for particulate accumulation (2936). The basin outlet was designed so that water would drain, but oils and other contaminants would be trapped inside the basin reservoir area (2936). The basin reservoirs were cleaned every three months (2936).

#### a) Dry-dock Discharge (Outfall 001)

Vessels were repaired in the dry-dock (2786). It had external dimension of 117 feet wide, 493 feet long, and 14 feet high (2786). The dry-dock was cleaned of spent grit and others before undocking operations, when the repaired vessel is floating by flooding the dry-dock. Water was pumped to ballast tanks to sink the dry-dock and float the vessel (2786). The undocking of the vessel would disperse any waste and material that remained on the dry-dock deck (2786). The other discharge from the dry-dock consisted of

hydroblasting water. When a vessel was dry-dock, a sample was taken before the dock was sunk from the ends of the dry-dock to quantify background conditions of surface water quality (2868). Another set of tests was taken when the dock is sunk, after mixing with whatever contaminants remained on the dock after cleaning (2868).

## b) Stormwater Outfall 002

This system serviced a small area of the shipyard outside the main office, including the hazardous waste containment area (2686). It was approximately 50 feet in length and has one catch basin and discharged below Pier 25 (2686). Samples taken in March, 1991 found that this outfall contained copper (0.4 ppm), lead (0.032 ppm), zinc (1.0 ppm), benzene (3.4 ppb), toluene (24.2 ppb), xylenes (52.7 ppb), and trichloroethane (33.1 ppb) (2786, pg. 4). Benzene, toluene, xylene and trichloroethane were found in the samples taken from outfall 002 in 1991 (2786). This system receives spillage from the handling of waste solvents and the solvent reclamation still, as well as spillage and runoff from the hazardous waste containment area (2786).

## c) Stormwater Outfall 003

This system drained the area near the machine shop (2686). It was approximately 125 feet in length with two catch basins and discharged below Pier 25 (2586). Samples taken in March, 1991 found that this outfall contained copper (1.0 ppm), lead (0.250 ppm), zinc (2.3 ppm), xylenes (15.6 ppb), and trichloroethane (1.8 ppb) (2786, pg. 4).

#### d) Stormwater Outfall 004

This outfall drained areas of the shipyard near the fabrication areas, paint ship and spray building, sand blast shed and shoreside ship repair area. It was approximately 350 feet in length, included six catch basins and discharged under Pier 24. Samples taken in March, 1991 found that this outfall contained copper (0.5 ppm), lead (0.048 ppm), zinc (4.3 ppm), MEK (2870 ppb), xylenes (3.9 ppb), and trichloroethane (0.8 ppb) (2786, pg. 4). VOCs, xylene and methyl ethyl ketone (MEK) were found in the discharge of outfall 004 in 1991 (2786). Xylene is a common component in paints, varnishes and sealants, and MEK is a solvent commonly used to remove paint (2786). Both of these substances were found in waste thinner at the plant (2786). In 1996, there were changes in property lines by the Port of Tacoma to accommodate Tyson Seafoods, and this outfall no longer fell within the boundaries of the AK-WA yard (2868).

#### 4). NPDES PERMIT

AK-WA was issued a NPDES permit (No. WA-004014-2) on 06/28/91 to allow discharge from the dry-dock (Outfall 001), and stormwater from Outfalls 002, 003, and 004 (2985). Dry-dock drainage water and water from the hydroblasting system was collected and pumped to a pier-side treatment system, then placed in a tank and then transported and discharged to the City of Tacoma sewer, although they did not have a permit or authority to do so (2985).

Through 1991, samples were conducted for oil and grease, total suspended solids (TSS), pH, total recoverable (TR) copper, TR lead, TR zinc, TR nickel, and TR mercury (2926). On 05/04/93, Ecology stated that monitoring for TR lead, TR Nickel and TR mercury would not have to be conducted because those compounds were not detected in toxic amounts for the past 6 monthly rain events (2926).

Discharge monitoring reports (DMRs) from December 1991 through January 1993 indicated that AK-WA did not meet the permit's limits for copper and zinc (2985). DMRs from August 1992 to January 1993 indicated the facility did not meet its permit limits for lead (2985). Ecology found that that AK-WA's DMR values for metals between 8/10/91 and 2/4/92 were found to suspect, because split samples taken by Ecology were significantly lower than AK-WA's contract laboratory's results. AK-WA changed their contract laboratory in June, 1992.

AK-WA's NPDES permit set effluent limits for outfalls 002, 003, 004 and the dry-docking discharges (outfall 001) (2786). Discharges from the dry-dock were required to be monitored during each day of undocking for the first three years of the permit (2786). Hydroblasting discharges from the dry-dock were required to be monitored weekly whenever hydroblasting was performed (2786). The permit also required sediment monitoring immediately offshore of each outfall and a bioassay of surface sediments (2786). The permit also required a Best Management Plan for the control of effluent discharges (2786).

A second NPDES permit (No. WA-00414-2) was issued by Ecology on 12/24/96 that became effective on 01/24/97 (2726). Giannotti appealed the permit on 01/27/97 because it claimed effluent limits were not technologically feasibly, TBT requirements were inappropriate, and that Ecology's deadlines were not adequate to design and implement AKART systems (2826). The company's NPDES Permit required the implementation of Best Management Practices (BMPs) (2931).

On July 8, 1997, the Department of Ecology issued Order No. DE 97WQ-S260, which revoked AK-WA's NPDES permit (2788). This action was taken after AK-WA violated its permit limits for total suspended solids (TSS) and oil and grease in November and December of 1996 and January of 1997 and failed to submit an acceptable All Known, Available, and Reasonable Methods of Treatment (AKART) report in accordance with its NPDES permit (2788).

## 5). NPDES PERMIT VIOLATIONS (2937 and 2993)

## al Copper

i) Daily Maximum Total Recoverable Copper AK-WA's permit limit was 2.9 µg/L.

Period of Violation	Outfall Number	Reported Value
1). 5/92 to 7/92	001	4,130 μ <b>g/L</b>
2). 2/92 to 4/92	001	6,900 µg/L
3). 11/91 to 1/92	001	16,400 μ <b>g/L</b>
4). 8/91 to 10/91	001	41,000 μg/L

ii) Monthly Average TR Copper AK-WA's permit limit was 2.9 μg/L.

Period of Violation	Outfall Number	Reported Value
1). 8/93 to 10/93	002	196 μ <b>g/L</b>
2). 8/93 to 10/93	003	97 μ <b>g/L</b>
3). 8/93 to 10/93	004	181 μ <b>g/L</b>
4). 5/93 to 7/93	002	195.3 <b>3 μg/L</b>
5). 5/93 to 7/93	003	245.66 μ <b>g/</b> L
6). 5/93 to 7/93	004	360.33 μg/L
7). 2/93 to 4/93	002	141.5 μ <b>g/L</b>
8). 2/93 to 4/93	003	682.5 μg/L
9). 2/93 to 4/93	004	85.5 μ <b>g/L</b>
10). 12/92	002	462 μ <b>g/L</b>
11). 12/92	003	315 μ <b>g/L</b>
12). 12/92	004	253 μg/L
13). 11/92	002	203 μ <b>g/L</b>
14). 11/92	003	158 μ <b>g/L</b>
15). 11/92	004	129 μ <b>g/L</b>
16). 8/92 to 10/92	002	134 μ <b>g/L</b>
17). 8/92 to 10/92	003	404.33 μ <b>g/L</b>
18). 8/92 to 10/92	004	839. <b>33</b> μ <b>g/L</b>
19). 5/92 to 7/92	002	512 μ <b>g/L</b>
20). 5/92 to 7/92	003	609 μg/L
21). 5/92 to 7/92	004	154 μ <b>g/L</b>
22). 2/92 to 4/92	"A"	630 μ <b>g/L</b>
23). 2/92 to 4/92	"B"	970 μ <b>g/L</b>
24). 2/92 to 4/92	"C"	148.66 μ <b>g/L</b>
25). 11/91 to 1/92	002	968.33 μ <b>g/L</b>

26). 11/91 to 1/92	003	1 <b>7</b> 11.66 μg/L
27). 11/91 to 1/92	004	921.66 μg/L
28). 9/91 to 10/91	002	1800 μg/L
29). 9/91 to 10/91	003	1800 μg/L
30). 9/91 to 10/91	004	1800 μg/L

## b) Zinc

 i) Daily Maximum Total Recoverable Zinc AK-WA's permit limit was 95 μg/L.

Reported Value
790 μg/L
3,100 µg/L
4,150 μg/L
5,500 μg/L
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ii) Monthly Average TR Zinc

AK-WA's permit limit was 95 μg/L.

Period of Violation	Outfall Number	Reported Value
1). 8/93 to 10/93	002	1340 μg/L
2). 8/93 to 10/93	. 003	797 μg/L
3). 8/93 to 10/93	004	1580 μg/L
4). 5/93 to 7/93	002	750.33 μg/L
5). 5/93 to 7/93	003	668.33 μg/L
6). 5/93 to 7/93	0.04	2270 μg/L
7). 2/93 to 4/93	002	1258.5 μg/L
8). 2/93 to 4/93	. 003	2093.5 μg/L
9). 2/93 to 4/93	004	2351.5 μg/L
10). 12/92	002	2114 μg/L
11). 12/92	003	1031 μg/L
12). 12/92	004	3231 μg/L
13). 11/92	002	2210 μg/L
14). 11/92	003	1480 μg/L
15). 11/92	004	3520 μg/L
16). 8/92 to 10/92	002	1990 μg/L
17). 8/92 to 10/92	003	283 I μg/L
18). 8/92 to 10/92	004	6110 μg/L
19). 5/92 to 7/92	. 002	41 <u>6</u> 0 μg/L
20). 5/92 to 7/92	003	870 μg/L

21). 5/92 to 7/92	004	. 1930 μg/L
22). 2/92 to 4/92	"A"	4610 μg/L
23). 2/92 to 4/92	"B"	6620 μg/L
24). 2/92 to 4/92	"C"	7466.66 μg/L
25). 11/91 to 1/92	002	3890 μ <b>g/</b> L
26). 11/91 to 1/92	003	4956.66 μg/L
27). 11/91 to 1/92	004	3706.6 μg/L
28). 9/91 to 10/91	002	380 μg/L
29). 9/91 to 10/91	. 003	380 μ <b>g/</b> L
30). 9/91 to 10/91	004	380 μg/L
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## c) Lead

i) Daily Maximum Total Recoverable Lead AK-WA's permit limit was 140 μg/L.

Period of Violation	Outfall Number	Reported Value
1). 11/91 to 1/92	001	210 μg/L
2). 8/91 to 10/91	001	290 μg/L

ii) Monthly Average Total Recoverable Lead AK-WA's permit limit was 140 μg/L.

Period of Violation	Outfall Number	Reported Value
1). 11/91 to 1/92	003	373.33 μg/L
2). 9/91 to 10/91	002	4240 μ <b>g/</b> L
3). 9/91 to 10/91	003	4240 μg/L
4). 9/91 to 10/91	004	4240 μg/L

## \*d) Oil and Grease

i) Daily Maximum Oil and Grease AK-WA's permit limit was 15 mg/L.

Period of Violation	Outfall Number	Reported Value
1). 2/92 to 4/92	001	41.2 mg/L

## ii) Monthly Average Oil and Grease AK-WA's permit limit was 10 mg/L.

Period of Violation	Outfall Number	Reported Value
1). 2/92 to 4/92	001	41.2 mg/L
2). 2/92 to 4/92	"A"	10.13 mg/L
3). 2/92 to 4/92	"C"	22.63 mg/L
4). 11/91 to 1/92	002	23.26 mg/L
5). 11/91 to 1/92	003	18.53 mg/L
6). 9/91 to 10/91	004	15.7 mg/L
7). 10/96	003	41.9 mg/L
8). 05/96	002	69.1 mg/L
9). 09/96	002	27.3 mg/L
10). 10/96	002	17.1 mg/L
11). 10/96	003	41:9 mg/L
12). 11/96	002	19 mg/L
13). 11/96	003	27.7 mg/L
14). 12/96	002	39.3 mg/L
15). 12/96	003	46.4 mg/L
16). 01/97	002	41.4 mg/L
17). 01/97	003	78.6 mg/L

## 6). SIGNIFICANT SPILLS AND RELEASES

## a) Diesel

05/15/91 (2944)

AK-WA was lifting the vessel, Aupullo into dry-dock when a leak was discovered in a stern tube. According to an Ecology report, no more than 50 gallons were spilled. An oil sheen was seen on the Hylebos.

(Undated incident) (2936)

An estimated 3,000 gallons of #2 diesel fuel was spilled as a result of dry docking a heavily damaged ship that had run aground and had damaged fuel tanks. The fuel tanks had been pumped prior to dry-docking, but residual amounts of fuels leaked out of the vessels hull during dry-docking operations. The oil was contained and cleaned up in approximately three days. This discharge included 2-butanone, xylene, toluene, and petroleum contaminants (PRC, 1993).

11/19/92 (2905)	A hose failed at the truck pump while pumping was occurring releasing 20 gallons near the south side of Building 588 in front of the pipeshop. According to AK-WA, 98% of the material was recovered.
b) Oil	
09/09/94 (2941 and 2960)	AK-WA reported a 100-gallon release from a ship in dry-dock. They were removing bottom paint when oil spill onto the deck area and into the Hylebos from the hull.
02/20/95 (2940)	AK-WA reported a 15 to 20 gallon spill of light grade lubricating oil. The compressor discharged into containment onto pier and into the Hylebos. An oil sheen was seen on the Hylebos. Absorbent pads and sweeps were put out.
06/19/95 (2928)	AK-WA reported that a vessel discharged its bilge oil while it was typing up at the pier. It was estimated that 10 gallons of used engine oil were released to the Hylebos. The chief engineer stated that the oil/water separator failed.
c) Other	
1989 (2955)	An AK-WA employee referred to a "large fuel oil spill of approximately 17,000 gallons" in a 04/24/89 letter. Approximately 15,200 gallons were recovered.
02/28/92 (2907)	An Ecology spill response official documented a discharge of blasting wastes in the Hylebos from AK-WA, demonstrating a disregard for the plant's BMPs outlined in their NPDES permit.
01/22/94 and 01/23/94 (2894)	According to AK-WA, there were unauthorized discharges of hydroblasting water containing "excessive levels of copper, zinc and total suspended solids." The company

estimated that 2,430 gallons of water were discharged.

## 7). COURT ACTIONS

## a) Order

1997 Order No. DE 97WQ-S260 (2788) This order was given on 07/08/97. It re-

voked AK-WA's NPDES permit. This action was taken because AK-WA violated its permit limits for total suspended solids (TSS) and oil and grease in November and December of 1996 and January of 1997 and failed to submit an acceptable All Known, Available, and Reasonable Methods of Treatment (AKART) report in accordance with its NPDES permit (2788).

## b) Penalty

1997 Penalty No. DE 97WQ-S148 (2810, 2799) This penalty was issued on 04/14/97 in the amount of \$52,000. This penalty was issued because AK-WA was not implementing their Best Management Practices (BMPs) (such as sweeping and covering materials) as required by their NPDES permit and the fact that there were violations for their stormwater outfalls 002 and 003 in November and December of 1996 and January of 1997 for Oil and Grease and Total Suspended Solids (TSS).

This was penalty was appealed by Giannotti Corp. on 05/05/97.

## c) Citizen Suit

1994 (2809, 2937, 2993)

On 05/06/94, Richard Smith, representing Pacific Environmental Enforcement Council (PEEC) filed an intent to file a citizen suit against AK-WA, under Section 505 of the Clean Water Act.

The suit was settled out of court for \$34,000. As part of the settlement, AK-WA

agreed to install a stormwater collection and treatment system, but never implemented this provision of the consent decree because they stated that they could not make the improvements until the Port of Tacoma improved the site's infrastructures (paving and storm drain improvement). The Port refused to conduct these improvements because AK-WA had not paid its lease.

## d) Notice of Violation

1993 Notice of Violation No. 93-011 (2938)

On 05/26/93, the City of Tacoma issued a NOV to AK-WA for discharging approximately 4,000 gallons of pretreated process wastewater to the sanitary sewer without obtaining prior approval on 03/16/93 and 03/17/93.

## FOR OFFICE USE ONLY

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	Waterway Segment 0
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REQUEST FOR COVERAGE UNDER ATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

junes boorlell BOATYARD GENERAL PERMIT This information will be used to determine if coverage by a general permit is appropriate. All questions must be answered completely and accurately to be considered for coverage. If a question does not apply, answer with NA. SECTION A. GENERAL INFORMATION 1. Name of facility: HYLAND Engineering, Inc. d.b.a. HYLAND Marine 2. 1690 Marine View Drive Mailing address: Street WA Tacoma 98422 City State Zip 3. 1690 Marine View Drive Facility address: Street Tacoma WA 98422 City State Zip 4. Primary contact person: Danie W. Hyland President (253) 572-0571 Name Title Phone Number 5. Alternate contact person: Karen R. Hyland Vice President (253) 572-0571 Title Phone Number Name I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. Danie W. Hyland President Printed name of person signing Title

7-23-98

Signature of applicant

Date application signed

# NPDES GENERAL PERMIT APPLICATION QUESTIONNAIRE Page 7

SF	CT	ION	F	PA	IN	TIN	G F	PRA	CT	<b>ICES</b>

1.	What containment practices do you use to control fugitive emissions from spray painting?						
	Spray painting if done would be done within an enclosed fixed structure with adequate filtration of exhaust air.						
2.	What anticorrosive paints are commonly used at your facility?  (you may attach manufacturers data sheets)						
	Paints with Zinc Chromate as their active ingredients						
3 a.	What anti-fouling paints are commonly used at your facility?  (you may attach manufacturers data sheets)						
	Paints with Cuprous Oxide as their active ingredients						
b.	Do you have pesticide application license? No						
c.	When was your pesticide application license obtained or renewed?  N/A						
4.	Describe the location and construction of the paint storage building or area.						
	The paint storage building is located on the South property line as indicated on Site  Map						
5.	What other paints, coatings, sealers, thinners, or solvents, etc. are used at your facility?						
	Epoxy fillers and resigns, Fiberglass fillers and resigns, Polyurethane paints, Varnish, Acetone, and Mineral Spirits thinners.						
6.	Where is paint mixed?						
	Paint mixing is done in the paint storage shed						

## MARTEN & BROWN LLP

ATTORNEYS AT LAW

1191 Second Avenue, Suite 2200, Seattle, Washington 98101 Telephone (206) 292-6300 Telefacsimile (206) 292-6301

April 18, 2000

Writer's Direct Line (206) 292-2637 e-mail: sparkinson@martenbrown.com

## Confidential Settlement Communication - DO NOT DISCLOSE

Robert A. Taylor NOAA 7600 Sand Point Way N.E. Building 1, 2nd Floor/BIN C15700 Seattle, WA 98115-0070

Robert J. Wolotira, Jr. NOAA 7600 Sand Point Way N.E. Building 1 Seattle, WA 98115-0070

Henry G. Landau, P.E., Ph.D. Geosphere Engineering LLC 23829 - 115th Place West Edmonds, WA 98020

Action to ship work also opening with also openi Natural Resource Damages Claim, Commencement Bay, Tacoma, RE: Washington

Dear Bob, Rob and Hank:

Enclosed are the documents for Appendix K (Department of Ecology Site Inspection Records) and Appendix L (RCRA violations) for the report entitled "Tacoma Boatbuilding Company, Yard 1; 1980-1996".

# Tacoma Boatbuilding Company, Yard 1 1980 to 1996

## **Background**

The former Tacoma Boatbuilding Company, Yard 1 was located at 1840 Marine View Drive in Tacoma, Washington. The 19-acre facility was established in 1969 by the Tacoma Boatbuilding Corporation which was incorporated in the State of Washington in 1947. In 1980, its stock was offered publically and in 1982 was listed on the New York Stock Exchange. Congressman Norm Dicks (D-Washington) a member of the Defense Appropriations Sub-Committee was a strong supporter of Tacoma Boatbuilding Company. On March 22, 1981, the Tacoma News Tribune reported:

"Dicks said the company would like to get a Navy contract to build attack submarines and become the nation's third builder of nuclear submarines, praising the company for consistently delivering military vessels on time and within budget."

A copy of the article is presented in Appendix A.

By 1982, Tacoma Boat employed 2,650 employees and was the largest industrial employer in the City of Tacoma at that time.

During the period 1980-90, the company suffered losses attributed to denial of cost escalation claims on several government contracts, a nine-week strike by labor during 1983, and higher than anticipated costs. Tacoma Boat lost \$1M in 1982 and \$20M in 1983. In 1984, Midland Capital Company and Tacoma Boat agreed to an arrangement where Midland had controlling interest in the corporation in exchange for \$20M in new capital. During July 1984, an agreement was reached with the U.S. Navy wherein the Navy provided the ailing Tacoma Boatbuilding with a cash payment of \$14M. This amount was beyond payments due as part of Tacoma Boatbuilding's existing contracts with the U.S. Navy. The following year, this arrangement was described by the Washington Post: "The Navy went out of its way to ensure the company . . . would survive." The article in the Washington Post asserted that the Navy had provided the shipyard with an additional \$26.5M in a special account. The Post claimed Vice Admiral Earl B. Fowler told a Congressional committee that money was used to pay local taxes and to finance work on non-Navy ships including two patrol boats (i.e., Corvettes) for Thailand. A copy of the article is presented in Appendix B.

According to the Tacoma News Tribune (article dated April 1, 1985), Norm Dicks "... a member of the House Defense Appropriation Sub-Committee, said he rallied to the defense of Tacoma Boat not only to protect 1,500 jobs in his district, but also to keep a high quality shipyard operating." A copy of the article is presented in Appendix C.

In 1985 bankruptcy proceedings were initiated under Chapter 11 of the Federal Bankruptcy Code. In 1988 the company emerged from bankruptcy. In 1990, the company lost \$3.3M during the first half, which triggered its closure. The company operated with a greatly reduced workforce during the period 1990 to 1996 when it again was forced to seek relief under Chapter 11. The facility closed permanently in December 1996.

## Work for the U.S. Government During 1980-1996

During the period 1980-1996 the Tacoma Boatbuilding Company did extensive work for the U.S. Government. Two classes of vessels were manufactured for the U.S. Coast Guard and a class of vessels were built for the U.S. Navy. In addition, two vessels were refurbished and rebuilt for the U.S. Navy by Tacoma Boat during this time frame. Four "Badr" Class (FSG) Corvettes were built for the Navy of Saudi Arabia under contract to the U.S. Navy who served as their contracting agent. For the U.S. Coast Guard, four "Famous" Class medium endurance cutters (WMEC 901-904) were built at Tacoma Boatbuilding's Yard 1.

According to "Jane's Fighting Ships 1990-91": "The contract for construction of WMEC 905-913 was originally awarded to Tacoma Boatbuilding Co. on 29 August 1980. However, under lawsuit from Robert E. Derecktor Corp., Middletown, Rhode Island, the contract to Tacoma was determined by a U.S. District Court to be invalid and was awarded to Robert E. Derecktor Corp. on 15 January 1981."

The company built two "Bay" Class ice breaking tugs (WTGB 105 and 107) for the U.S. Coast Guard at this site during 1980-1984. During the same period, the company built 12 U.S. Navy "Stalwart" Class ocean surveillance ships (T-AGOS-1-12) at this site. It also rebuilt and refurbished the USNS Hayes (T-AG 1) for the U.S. Navy which was completed by 1992.

According to "Jane's Fighting Ships 1990-91": "The T-AGOS programme appears in good shape after several rocky years stemming from the financial difficulties of Tacoma Boatbuilding Company which built the first eight ships but was unable to complete T-AGOS 9-12 before filing for bankruptcy. At one time, the Navy planned to have T-AGOS 9-12 built elsewhere in the Seattle-Tacoma area, but Tacoma Boatbuilding was finally awarded a contract in late 1987 to complete T-AGOS 11 and 12."

Tacoma Boatbuilding was awarded a \$166,000 contract in June 1983 for "bottom maintenance" of the "Discoverer," a 303 ft. oceanographic vessel operated by NOAA and based in Seattle.

Tacoma Boatbuilding was also awarded a contract worth \$1M to modify and overhaul the U.S. Navy ship "Mizar" (AGOR-11) in 1986-1987. In 1987, the Mizar was responsible

for a spill of Naval distillate fuel to the Hylebos. See NEESA 1989 Records Search; Page 13 which is presented in Appendix D.

· Details concerning these vessels are presented in Appendix E.

## Work for Foreign Governments During 1980-1996

Tacoma Boatbuilding Company was contracted by the U.S. Navy to build four "Badr" Class (FSG) Corvettes (FSG 612, 614, 616, 618) to be delivered to the Saudi Arabian Navy. While the U.S. Navy served as the contracting agent, the Saudis paid the entire cost of these vessels including the U.S. Navy contract administration cost. Construction of the four vessels began on 6 October 1979 and the final vessel was commissioned at the Tacoma Boatbuilding site on 10 January 1983.

During this period, Tacoma Boatbuilding built two Corvettes of the Rattanakosin Class (FSG 441 and 442) for the Navy of Thailand. According to "Jane's Fighting Ships 1999-2000", like the Badr Class corvettes, these vessels were fitted out with U.S. armaments including eight McDonnell Douglas "Harpoon" Surface to Surface Missiles, U.S. Mk 32 torpedo tubes, and were configured for the installation of a U.S. "Phalanx" close-in antimissile weapon.

It is unclear how much involvement the U.S. Government had in the procurement of these vessels by Thailand. It should be noted there was testimony by Vice Admiral Earl Fowler, USN, before a Congressional committee that U.S. Navy funds were used to support the construction of these vessels. The Rattanakosin (FSG 441) was commissioned on 25 September 1986 and the Sukhothai (FSG 442) was commissioned on 10 June 1987 at Tacoma Boatbuilding Yard 1.

Information concerning the vessels produced for foreign governments is presented in Appendix F.

## Work for the State of Washington During 1980-1996

Tacoma Boatbuilding did refurbishment on the Washington State Ferry, M/V Klickitat (replaced wooden wheelhouse with steel superstructure, a new galley and diesel engines) during 1982.

## Work for the State of During Alaska 1980-1996

Tacoma Boatbuilding performed major renovations of an Alaska State Ferry, M/V Taku (replaced staterooms, engine rooms and sanitary sewer system) during 1980-1981. This work was financed by the Federal Highway Administration.

## Hazardous Materials Used in Naval Shipbuilding and Repair

A wide variety of hazardous substances are used in the construction of Naval (including Coast Guard) vessels. A list of commonly encountered hazardous substances for which MSDS sheets were available in 1984, and was reported in Appendix D of the "Navy Shipboard Hazardous Material/Hazardous /Waste Training Manual" dated March 1984. This list is presented in Appendix G. These substances include the following substances of concern to the Hylebos Waterway in the vicinity of Tacoma Boat: polychlorinated biphenyls, antifouling paint constituents including metals, copper and tin, painting wastes that include petroleum products lead and cadmium, waste oils that contain polyaromatic hydrocarbons and metals including lead, zinc, copper and tin residues, solvents including chlorinated and non-chlorinated types (tetrachloroethene, trichloroethene, tricholormethane, 'Freon', ethyl acetate, acetone, xylene, methyl ethyl ketone, toluene, petroleum ether. (See Disposal Guidelines for "Navy Shipboard Hazardous Materials - Hazardous Waste Training Manual, May 1984".)

By 1984, the Navy had established guidelines for disposal of hazardous substances from its vessels. Disposal guidelines cover many of the substances anticipated to be present during the construction and operations of vessels built at Tacoma Boatbuilding during 1980-1996. Substances of concern referenced in these disposal guidelines include: chlorinated solvents, poly aromatic hydrocarbons, metals, PCB's, and tributyltin. The guidelines are presented in Appendix H. These lists are extensive, but are incomplete. For example, in the early 1980's ASARCO slag was widely used for sandblasting hulls of vessels, including Navy ships at the Puget Sound Naval Shipyard. It was used because it had excellent abrasive ("cutting") properties and could reduce the time and labor required for this activity. Also, PCB's were commonly encountered in the repair, conversion and maintenance of ships and ship systems. The U.S. Navy has identified various types of ships' components that frequently contain PCB's and may be subject to regulation. These components are identified in Appendix I. Information concerning the use of tributyltin by the U.S. Navy is presented in Appendix J.

## Environmental Compliance at Tacoma Boatbuilding Yard 1

Tacoma Boatbuilding Yard 1 had serious environmental compliance issues throughout the period 1980-1996. In spite of serious environmental compliance issues, the U.S. Government continued to support Tacoma Boatbuilding with contracts and direct financial assistance.

During 1989, the Washington Department of Ecology inspected the site and noted over 100 drums of hazardous waste were found at various locations on the site. Some were leaking or in open containers spilling to the soil and surface water. Many of the drums were unlabeled and most exceeded the 90-day limit for storage according to Ecology records. A copy of Ecology's inspection report is presented in Appendix J.

Disturbingly, the site had never obtained an EPA Identification number identifying it as a hazardous waste generator nor did the site have an NPDES permit for its waste discharges to the Hylebos. Numerous serious RCRA violations were noted including:

- Failure to report spills to the environment
- Failure to develop a written inspection plan
- Failure to notify as a transporter of hazardous waste
- Transporting unmanifested hazardous waste
- Failure to train employees
- Failure to develop a spill contingency plan
- Failure to keep hazardous waste drums closed
- Failure to place and store hazardous waste in containers that are in good condition
- Failure to perform weekly inspections
- Failure to properly inspect containers holding ignitable or reaction waste
- Failure to obtain an EPA Facility ID number
- Failure to designate solid waste as dangerous
- Failure to ship waste off site in 90 days to a designated permitted facility
- Failure to indicate accumulation start dates
- Failure to label containers
- Failure to submit annual (or biannual) reports

Copies of documents relating to these RCRA violations are attached at Appendix L. Limited sampling by Ecology personnel during the RCRA inspection revealed petroleum hydrocarbons (above MTCA Method "A" Cleanup levels) and detectable levels of PCB's were present in a very limited sampling of site soils. Id.

The Department of Ecology fined the corporation \$55,000 for its RCRA violations in August 1989. In 1992, the corporation applied for an NPDES permit for its point source discharge into the Hylebos Waterway. A permit was issued by Ecology effective April 1, 1993 through April 1, 1998. It required bimonthly monitoring for oil and grease, copper, lead and zinc. Semiannual monitoring was required for hazardous substance list ("priority pollutants"). According to the December 1994 Ecology NPDES inspection report, the corporation had not complied with the monitoring requirements associated with its NPDES permit. The report also noted sandblasting grit from ships hulls remained in piles, exposed to the environment and pollutants from the grit and hull paint were flushed directly into the Hylebos. The Ecology inspections noted the sandblasting grit used by the corporation contained elevated heavy metals. Ecology inspected the site again in April 1995 and noted little had been done to address the previous compliance issues. In June 1996, Ecology sent a letter indicating it would issue a unilateral order if the compliance issues were not resolved by August 1996. The facility closed permanently in December 1996.

## **Summary of Findings**

Agencies of the United States Government, primarily the U.S. Navy and U.S. Coast Guard, as well as the U.S. Department of Commerce/NOAA and the Federal Highway Administration engaged the Tacoma Boatbuilding Company during the period 1980-996. These engagements included contracts for ship construction, repair, refurbishment, modifications and maintenance. The government's intent in Tacoma Boatbuilding include, what appears to be financial underwriting of the firm during 1985-1986.

U.S. Navy and Coast Guard vessels were users of significant quantities of hazardous substances and generated considerable quantities of hazardous substances during the period 1980-1986. These substances identified in the "Navy Shipboard Hazardous Material/Hazardous Waste Training Manual, March 1984" include "constituents of concern" found in Hylebos Waterway sediments during studies conducted by various government agencies and private parties.

Apparently the U.S. Government did not audit or require its contractors to meet the environmental regulations and standards it applied to itself. For example, U.S. Executive Order 12088 dated 13 October 1978 "Federal Compliance with Pollution Control Standards" required all executive agencies (including the U.S. Navy and Coast Guard) to comply with the applicable \_ pollution control standards that apply to any civilian concern. And NAVMAT INST 6240.6A dated 8 June 1982 "Navy Hazardous Materials Environmental Management Program" require a specific program to better manage the use of hazardous materials and disposal of hazardous wastes.

The lack of an NPDES permit for point source discharges from Tacoma Boatbuilding Yard 1 as well as the serious RCRA violations encountered during the Department of Ecology inspection of 1989 provides evidence that the U.S. Navy, Coast Guard and other agencies did not include basic environmental management requirements in their contracts nor did they inspect or audit their contractors for basic environmental compliance.

## COPY IN SITE FICE



1 17/100

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REPORT REQUESTED YES OR NO

PICTURES YES OR NO

7

## Dalton, Olmsted & Fuglevand, Inc. Environmental Consultants

19017 120th Avenue N.E., Suite 107 • Bothell, Washington 98011 Telephone (206) 486-7905 (FAX 486-7651)

## **MEMORANDUM**

TO:

Allison Hiltner, US EPA

FROM:

Paul Fuglevand

DATE:

June 7, 1993

SUBJECT:

Hylebos Waterway: 401 Alexander, Zidell

REF. NO:

HYLCC-001

CC:

Norm Webb, Paul Beveridge, Len Sorrin, Brad Marten, Leslie Sacha

Per your request I am providing you additional information regarding the possible discharge into the Hylebos from Zidell Dismantling, formally located at 401 Alexander on the Hylebos Waterway.

Attached are records we obtained from the Washington Department of Ecology Headquarters files on Zidell Dismantling, Inc. The records indicate the following about the facility with respect to discharge or potential discharge to the Hylebos:

- September 3, 1969, Water Pollution Control Commission: floating material was being pushed into the waterway.
- March 4, 1970, Water Pollution Control Commission: oil spill at Zidell/Tacoma
- December 15, 1970, Department of Ecology: oil residues discharged into the Hylebos Waterway, notice of penalty issued.
- September 1972, USEPA: holding tank being emptied to Commencement Bay
- May 7, 1973, Harry Tracy & Gary Torhwell: oil spill at Zidell/Tacoma
- October 16, 1973, Department of Ecology: discharge oil into Hylebos Waterway, notice of penalty issued.
- March 1, 1975, Department of Ecology: 126 gallons Navy fuel oil into Hylebos Waterway

## WASHINGTON STATE DEPARIMENT OF ECOLOGY POLLUTION COMPLAINT REPORT FORM

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## U.S. ENVIRONMENTAL PROTECTION AGENCY



#### REGION X

1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101

September 14, 1972

Rich Buc

REPLY TO 10EP M/S #521

Enforcement Division

Mr. Mike Price Department of Ecology Southwest Regional Office P. O. Box 612 Olympia, Washington 98504

Dear Mr. Price:

On a recent visit to Zidell Dismantling, Tacoma, Mr. Larry Kyle, Engineering Aid, noticed a holding tank being emptied to Commencement Bay. Jack Zidell, who was accompaning him, explained that the contents of the holding tank was oily water that had been pumped out of a ships ballast tank.

This discharge seems to be in violation of Zidell's Waste Discharge Permit issued by the Department of Ecology. Enclosed is a copy of Mr. Kyle's trip report. If you have further questions, or I can help in any way, do not hesitate to call (206)442-1270.

Sincerely.

Dan Robison Washington Field Consultant

Co Colina

**Enclosure** 

## **MEMORANDUM**

## Water Pollution Control Commission

P. O. Box 829 OLYMPIA, WASHINGTON 98501

	Check
nformation	
for Action	
Permit	
Other	

ro: Gene Asselstine & Chuck Melville

DATE: March 5 and 6, 1970

FROM: Ron Robinson

SUBJECT: Zidell Dismantling - Tacoma

This firm had an accidental oil spill on March 4, 1970, and called air pollution in Tacoma to report it, thinking we were in the same agency. Inspection of this oil spill found it was accidental as the ship's hull settled on the grid during the lowering of the tide and a seam split releasing some oil and water from the tanks of this ship. This oil was just some residue left in the tanks which got mixed with incoming tidewater and when the tide went out, likewise the oil. Zidell boomed off the area as much as possible and were catching the oil with straw; they had hired extra men to clean up the oil. In regard to their permit, they were satisfying every condition regarding a spill.

Jack Zidell stated that a tug boat had towed the stern of the ship's hull out away from the dock in order to tie up a navy barge and the junk hull was not pushed back into its original position. This resulted in the rupture of the seam. We have an aerial photograph taken on March 3 of the navy barge in said position.

RSR:pb

occidental

Kondrat

## III. SIGNIFICANT CONTRIBUTORS TO THE CONTAMINATION OF THE HYLEBOS

# A. HOOKER/OCCIDENTAL/PIONEER CHEMICAL PLANT

## 1). INTRODUCTION

Hooker Electrochemical purchased a 21-acre facility located on Hylebos at 605 Alexander Avenue in 1928 and started production of chlorine and caustic soda at the facility the following year (687). In 1946, the company bought an additional 10.5-acre parcel from the Todd Shipyards (687). Between 1946 and 1956, Hooker deeded the northern 200 feet of the facility to the Hooker Detrex Company. The plant occupies the southern shore of the Hylebos between 3,100 and 4,400 feet from the mouth of the waterway (TTIb, 7.58).

The company's name underwent a number of changes, from the Hooker Electrochemical Company to the Hooker Chemical Corporation to the Hooker Chemical and Plastics Corporation. In June 1968, the Occidental Petroleum Corporation purchased Hooker. Hooker changed its name to the Occidental Chemical Corporation in July 1982, under speculation that the company was trying to improve its image after the Love Canal scandal (TNT, 1982).

On June 17, 1997, Pioneer Companies, based in Houston, Texas, purchased the plant for \$97 million in cash and \$5.5 million in Pioneer preferred stock (Gibbs, 1997). Pioneer owns another small bleach manufacturing plant, T-C Products, in Tacoma (Gibbs, 1997). On August 5, 1997, OCC Tacoma, a wholly owned subsidiary of the Occidental Chemical Corporation acquired the 4.4-acre PRI Northwest property located next to the plant (for more details, see the section on PRI Northwest below).

The priority chemicals that were found in the Mouth of Hylebos Waterway near the site include PCBs, HCB, TCE, PCE, 1,2-dichlorobenzene, 1,3-dichlorobenzene, HCBD, lead, copper zinc, HPAH and LPAH, methylphenanthrene, methylpyrene, biphenyl, and benzyl alcohol. Most of these contaminants have been found in the property's groundwater, soils and discharges. Tetra Tech identified Occidental as the major source of chlorinated organics to the Hylebos Waterway during its 1985 Remedial Investigation (TTIb, 7.70). This conclusion was based on the fact that there were elevated concentrations of chlorinated organic compounds in water sediments adjacent to the facility compared to the concentrations throughout the remainder of the waterway. Tetra Tech also determined that Occidental had a greater estimated loading of chlorinated benzenes, butadienes and ethenes to the Hylebos than any other source along the waterway. All of these substances were found in the main plant discharge from the plant.

#### 2). SITE HISTORY

## a) Chlorine-Caustic Plant

The chlor-alkali plant went into production in February 1929 and has produced chlorine and caustic soda every year since then (SEA, 1995). Occidental stores up to 70,000 tons of salt on its property, which they regularly spray water on, in order to collect the brine to use in the manufacture of chlorine.

Occidental has used a number of different types of electrolytic cells to produce these substances. The , one with a membrane that is under a vacuum and one with an asbestos diaphragm (935). The company produced 225 gallons a minute of pH 1 water, which was neutralized with caustic sodium hydroxide (935).

Occidental has utilized both diaphragm cells (installed in 1981) and membrane-cells (installed in 1988) for chlor-alkali electrolytic production processes. Caustic is concentrated to a 50% solution using heat and a barometric condenser. Large amounts of seawater are used as contact cooling during this process (968). The resulting wastewater is high in pH. The waste brine is recycled and the concentrated recycled brine is discharged to the outfall. Wastewater is treated by chlorine neutralization and by pH neutralization.

Occidental has produced a number of other products at the plant. Muriatic acid has been produced since the early 1930's, and sodium hypochlorite has been produced since 1974 (687).

Products that were once manufactured at the plant include hydrogenated fish oils (1939 to 1952), aluminum chloride was produced for the manufacture of high-octane gasoline (1942 and 1945), ammonia was produced between 1952 and 1992, although production was interrupted between 1979 and 1981. Small amounts of sodium aluminate were produced between 1959 and 1960.

#### b) Solvents Plant

Occidental produced industrial chlorinated organic solvents from 1947 to 1973, primarily trichloroethylene (TCE) and perchloroethylene (PCE) (687). The by-products of this production line were used to produce other substances. Between 1965 and 1974, calcium chloride was produced by evaporating the stripper effluent from the TCE plant (687). Since this period, it has been produced by reacting limestone with muriatic acid (1974).

## 3). CHEMICALS ASSOCIATED WITH PRODUCTION PROCESSES

## a) Chlor-Alkali Processes

i) Chlorine Stripper, Chlorine Purification Unit, and Spent Anodes

Until 1988, when the plant installed new state-of-the-art membrane cells, Occidental relied on the diaphragm cell process. The electrodes used in the cells were composed of graphite with lead contacts and impregnated with linseed oil coatings, which resulted in the introduction of lead and chlorinated organics into the plant's wastewater. The purpose of the linseed oil was to prevent it from corroding too quickly. The unsaturated bonds of the linseed oil reacted with the free chlorine to form 40 to 60 gallons a day of a number of chlorinated organic by-products (40-60 gpd).

Chlorinated organic contaminants were released from the plant's chlorine purifying unit, chlorine stripper, and spent graphite anodes that were dumped in numerous places (619 and 1045). These compounds left the electrolytic cell with the chlorine gas and were processed by direct and/or indirect cooling (TTIb, 7.59). One portion of this waste continued through drying, compression, and purification processes while the other portion was directed to the chlorine stripper for recovery of the remaining chlorine gas. Chlorine is cooled, dried, compressed, purified, and undergoes compression. Chemicals associated with these operations include chlorine, sulfuric acid, Freon, carbon tetrachloride, chloroform, PCE, TCE, hexachloroethane (938).

From 1929 to 1969 or 1970, effluents from both the chlorine purification and the chlorine stripper were discharged directly to the Hylebos through the main effluent. The waste consisted of about 50-75 gallons a day of waste containing primarily chloroform, carbon tetrachloride and hexachloroethane, waste that was discharged to the Hylebos Waterway by #2 outfall.

After this period, low boiling organics saturated with chlorine gas from the chlorine purification unit were drawn off and were stored on-site in railroad tank cars for out-of-state incineration (619). In 1981, there were 15 cars waiting to be sent to New York for incineration (618). The effluent from the chlorine stripper continued to be discharged to the Hylebos through the main plant outfall. Ecology found that the chlorine stripper effluent contained a variety of chlorinated organics including TCE (30 ppb), HCB (30 ppb) and HCBD (9 ppb). These were diluted by the total plant effluent to 4, 0.3, and 0.2 ppb, respectively (TTIb, 7.61). In the early 1980's, Hooker began to switch to Steel-Titanium alloy anodes to eliminate the generation of chlorinated organics. Approximately one-third of the cells had been converted by 1981. In 1989, the plant was producing 50-75 gallons a day of chloroform, carbon tetrachloride, and hexachloroethane (687). From 1970 to 1979, these wastes were stored in railroad tank cars, and as of 1989, were sent to an incineration unit.

## ii) Brine Sludge and Asbestos Waste

The plant produced about 3 tons of brine sludge a day (dry basis) which was? composed primarily of calcium carbonate, magnesium hydroxide, sodium chloride, and 1.5% strontium and 0.2% lead (619 and 1045). From 1929 to the period of 1965-70, this? material was discharged to the Hylebos Waterway through outfall #2. From 1965-1970 to 1972, it was discharged to the plant's lime barge, with the liquid decanted to the Hylebos Waterway and the solids periodically hauled to a deep-water disposal site in the Bay. From 1972 to 1977, the sludge was dumped in two on-site pits in the southwest corner of the property. From 1977 to after 1979, the brine sludge was filtered and the filtrate was returned to the brine system and the sludge was sent to the Tacoma Municipal Landfill.

Approximately two cubic yards of asbestos waste was generated daily in 1971. Asbestos composed the diaphragm in the cells, and asbestos waste was produced in the process of washing cathodes. From 1929 to 1971, asbestos was trapped by a strainer in the cathode washroom and was placed along the bank bordering the Hylebos Waterway. After this period, the asbestos that was trapped by the cathode-washing strainer was sent to the Tacoma Municipal Landfill. The asbestos that bypassed the cathode strainer was combined with the brine sludge and dumped at the Landfill and other sites around Commencement Bay (see below).

## b) Solvent Processes (938 and 1063)

The solvent plant operated from January 1947 to May 1973. The plant produced 500 tons/year of "Generator and Stripper Lime" waste. This material consisted of calcium chloride, excess lime, inert inorganic solids and chlorinated organic compounds (TTIb, 7.61). Occidental estimated that the solids in this waste contained 3-4,000 ppm of chlorinated organic compounds and included dichloromethane, chloroform, carbon tetrachloride, TCE, PCE and HCBD. On its RCRA Part B Application, Occidental also noted that other chemicals associated with its solvent plant included "solvent stabilizers," HCB, pentachloroethane, acetylene, 1,1,2,2-tetrachloroethane and chlorinated butanes (1063, Table 1).

Between 1947 and 1950, all solvent wastes were discharged to the Hylebos. Between 1950 and 1952, wastes were discharged to a pond near the northwest plant boundary, near the present-day salt pad, with the liquid being decanted to the Hylebos. Between 1952 and 1972, wastes were discharged to a lime barge in the Hylebos. Liquids were decanted to the Hylebos and solids were barged and dumped in the Bay. For a brief period in 1972, wastes were discharged to one of two pits in the southwest corner of the plant property. The liquids were decanted to the Hylebos and the solids were trucked to the Tacoma Municipal Landfill. Between May 1972 and June 1972, waste continued to be discharged to the pits. The liquids were decanted to the Hylebos and solids were trucked to the Petarcik site, near Fife. From June 1972 to May 1973, wastes were discharged to the pit, with liquids decanted to the Hylebos, and solids trucked to the General Metals on the north shore of the upper Hylebos Waterway and the Don Oline property, 0.8 km

## 4). SIGNIFICANT CONTAMINATION LINKS TO THE HYLEBOS

#### a) Introduction

Geohydrological studies have confirmed that the groundwater at the property discharges to the Hylebos waterway, so contamination of the piant's groundwater and soils could likely have led to contamination of the Hylebos (687). Surface water from the plant was discharged via three outfalls (687).

## b) Confirmed Sources of Contamination

## i) Direct Discharge of Wastes

Point discharges from the plant included the main plant effluent (HY-707), seven steel pipes protruding from a bulkhead on the Occidental waterfront (HY-0-085), groundwater seeps (HY-083), and groundwater discharge beneath the facility (Areas 2 and 3) (TTIb, 7.53 and Table 7.2.4). As discussed above, the chlorine-purifying unit generated liquid waste containing chlorinated organics that was discharged directly to the Hylebos from 1929 to 1970 (687). Between 1947 and 1957, it is estimated that the plant annually discharged 500 tons of generator and stripper lime containing calcium chloride, excess lime, and high boiling chlorinated organic residue to the Hylebos.

Another plant waste was brine sludge, which contained calcium carbonate, magnesium hydroxide, sodium chloride, strontium and lead. As of 1989, 3 tons were produced daily. From 1929 to 1970, this sludge was discharged directly to the Hylebos and to a barge. Decant from the barge was pumped into the Hylebos and solids were dumped at a deepwater disposal site in Commencement Bay (687).

## ii) Surface Water Drainage

Another source of contamination from the plant was thorough surface water drainage (687). Drainage from the Occidental facility was discharged to the Hylebos by three main outfalls (687).

## iii) On-Site Waste Disposal

#### • Brine Sludge and Asbestos Pits

Between 1972 and 1977, brine sludge and asbestos were dumped in two onsite pits in the southwest corner of the property (687). After this period, the sludge was hauled to the Tacoma Municipal Landfill.

## • Reclamation Projects

From 1929 to the third quarter of 1971, solid wastes from plant operations were used for landfill along the Hylebos to reclaim and expand the waterfront property. It is estimated that the total volume of this fill was 12,000 cubic yards, 40% of which was plant process wastes. These wastes included concrete cell bodies, filtering media from the sodium chloride brine purification system and oil hydrogenation operations, asbestos, graphite pieces, non-burnable wastes, lime and dirt (many of these would be classified as hazardous waste under RCRA) (1075).

## • Graphite Waste Pile

From 1978 to the end of 1980, used graphite pieces from electrolytic cells were placed in a pile (measuring 50 feet by 34 feet by 7 feet) in the southwest corner of the site, west of the ammonia production building. One end of the blades was encased in lead, which under current RCRA regulations would have been considered a hazardous waste because its total lead content ranged from 1,000 to 5,000 ppm (1075). The pile was later covered with a shelter to minimize groundwater contamination.

Samples that were taken in and around the area of the waste graphite pile exceeded the mean background levels for lead and pentachlorophenol. Background levels for lead ranged from 1 ppm to 542 ppm, with the bulk of the higher levels in the first 3 inches of the soil surface. Levels in the vicinity of the waste pile building ranged from 2.1 ppm to 1,000 ppm, with of the contaminated samples being found in the first 3 inches. According to an EPA report, "It is likely that this lead contamination is the result of a spill(s) that occurred while transporting waste pile materials to or from the waste pile." Occidental proposed to address the clean-up of the lead at the time of closure of the waste pile, which was supposed to occur in the year 1988 (938). Samples that were taken before the pile was cleaned up in 1989 found (max. conc.) TCE (6.0 ppb), PCE (12 ppb) and lead (2,830 ppm) (2732). After the closure activities, the maximum concentrations dropped to 0.6 ppb, 2.6 ppb, and 551 ppb, respectively (2732).

#### Solvent Waste Ponds

Between 1950 and 1972, the solvent plant produced 500 tons of "generator and stripper lime" consisting of calcium chloride, excess lime, inert inorganic solids and highly chlorinated organic residue. This material was dumped in the area of present salt pad (617). The slurry was estimated to contain 25% solids primarily the chloride and hydroxide of calcium. This material is estimated to have averaged about 0.5% chlorinated solids, lead (25 ppm) and copper (6 ppm) (615). The pollutants associated with the solvent area are chlorinated organics such as TCE, PCE, tetrachloroethane (C<sub>2</sub>Cl<sub>2</sub>Cl<sub>4</sub>), pentachloroethane (C<sub>2</sub>Cl<sub>5</sub>H), hexachloroethane (C<sub>2</sub>Cl<sub>6</sub>), chloroform, and carbon tetrachloride (1045) (616 and 617).

The plant also produced about 500 tons a year of "Generator and Stripper Lime" waste, which consisted of calcium chloride, excess lime, inert inorganic solids and some high boiling chlorinated organic residue. From 1947 to 1950, all waste was discharged to the Hylebos through #1 outfall. Between 1950 and 1952, all waste was directed to a pond located in the area that is now occupied by the salt pad. The liquid was decanted into the

Hylebos, and the solids were trucked to unknown sites on the Tideflats. Between 1952 and 1972, all waste was directed to the lime barge, with the liquid decanted overboard to the Hylebos and the solids dumped in a deep-water disposal site in Commencement Bay. Between the end of this period and April 30, 1972, waste was dumped in two on-site pits located in the southwest corner of the plant property, with liquid decanted to the Hylebos and solids being trucked to the Municipal Landfill.

The production wastes from the solvent plant were disposed of in six on-site ponds and impoundments between 1949 and 1952. Four ponds were located side-by-side along the Hylebos and two were located in the northeast quarter of the plant near the present Salt Pad area. The waste dumped in these areas contained calcium hydroxide slurries and effluent from the dehydrochlorination stripper process, which consisted of a calcium chloride solution with calcium hydroxide solids and "trace amounts" of chlorinated organics. All six ponds were emptied and filled with clean dirt in September 1953 (687). Occidental pumped in slurry wastes into the settling ponds, and decanted the liquid directly to the Hylebos. Solids were dredged and dumped into a deep-water site in Commencement Bay.

Using theoretical calculations and data collected in the 1960's, an analysis was made of the disposed material in these ponds. The results are Ca(OH<sub>2</sub>) (12.3%), CaCl<sub>2</sub> (12%), H<sub>2</sub>0 (75%), Fe (500 ppm), Mg (1,000 ppm), Zn (0.5 ppm, Cu (6 ppm), Pb (25 ppm), and chlorinated organics (0.5%). The components of the chlorinated organic portion were estimated to be (percent by unit): TCE (4%), PCE (5%), unsymmetrical tetrachloroethane (0.05%), symmetrical tetrachloroethane (0.01%), pentachloroethane (0.05%), hexachloroethane (10%), and unknown highly chlorinated organics (80%).

Two additional holding ponds were built in February 1972 to hold wastes from the solvent plant and other production processes (687). They contained material that was similar to the solvent wastes described above, plus brine sludge, asbestos, filter cake from the calcium chloride filtering operation, brine, salt, and caustic soda tank sludges. The ponds were emptied and filled with sand and gravel in 1978 (687). The wastes in these ponds changed slightly after the solvent plant closed. From 1972 to 1973, solvent plant waste and brine sludge were settled in on-site ponds prior to land disposal. Estimates of the wastes between 1972-1973: (Ca(OH)<sub>2</sub> (15%), CaCl<sub>2</sub> (6%), H<sub>2</sub>0 (75%), NaCl (1%), Mg(OH)<sub>2</sub>, CaCO<sub>3</sub> (0.3%), Fe (100 ppm), Cu (10 ppm), Ni (12 ppm), Zn (1 ppm), Mn (5 ppm), Pb (50 ppm), asbestos (0.1%), Al (3,000 ppm), and chlorinated organics (0.4%). In 1973, the solvent plant was shutdown, and the sludges in this pond no longer contained solvent plant lime wastes. The approximately 30% solids contained primarily sodium chloride, calcium salts and magnesium hydroxide at 10, 13 and 6%, respectively. Approximately 3% of the material was composed of asbestos, along with fractional percentages of iron (0.6 ppm), lead (0.45 ppm), and chlorinated organics (0.1%). Mercury was undetected, but other metals that were found include Co (75 ppm), Cr (10 ppm), Cu (30 ppm), and Cd (10 ppm). The wastes between 1973 and 1978 contained (Ca(OH)<sub>2</sub> (5%), CaCl<sub>2</sub> (2%), H<sub>2</sub>0 (70%), NaCl (10%), Mg(OH)<sub>2</sub> (6%), CaCO<sub>3</sub> (6%), Fe (0.6%), Cu (31 ppm), Ni (76 ppm), Zn (150 ppm), Mn (80 ppm), Pb (4,600 ppm), asbestos (3%), Al (300 ppm), and chlorinated organics (0.1%),

#### • Sodium Aluminate Pit

Between 1959 and 1960, approximately six tons of off-grade material from sodium aluminate production was dumped in a small pit near the manufacturing site. The pit was filled with sand after this period (1075).

#### iv) Leaks in Plant Facilities (1347)

Significant amounts of sodium hydroxide (NaOH) have been found in subsurface soil and groundwater samples from certain areas of the plant. Hooker examined the floor and trenches in the caustic building in 1980 and found numerous cracks and suspected leaks, and they suspected that this was the most likely source of the material. Hooker did not believe the caustic posed an eminent environmental hazard because they suspected that most of it would react with the moist soil forming sodium carbonate and sodium silicates. They believed that dilution would dissipate the caustic and that any caustic that did reach the Hylebos would react with minerals in the salt water to form substances like magnesium hydroxide.

#### v) Drum Storage Area

In May of 1991, Ecology conducted a RCRA Permit Compliance Inspection and found a number of violations with Washington Dangerous Waste regulations and federal hazardous waste regulations that suggest potential sources of contamination to the Hylebos (927). First, there were several corroded and rusting metal 55-gallon drums of dangerous waste (927). At least two of the drums had begun to leak. Next, the chemical resistant coating on the concrete floor of Cells A and B of the hazardous waste container storage area was cracked and it could no longer prevent contamination of the concrete or underlying soil (927). The plant's Drum Storage Area was finally closed in 1991 (2732). Both TCE (max. conc. = 1,600 ppb) and PCE (max. conc. = 1,900 ppb) were found at the 21-inch depth, the maximum depth that was sampled (2732).

#### vi) Off-Site Waste Disposal

Throughout the life of the on-site disposal ponds, dredged solids were removed and disposed of at a number of public and private sites, including the Tacoma Municipal Landfill, a site at Alexander Avenue, and two sites on Pacific Highway East. There were three upland dumpsites in the Tideflats areas, all of which received wastes from other companies as well. These sites were named the "Petarcik," "Oline", and "General Metals" sites. Since these sites do not drain to the Hylebos, they are not discussed in detail in this report.

#### • Waste Composition

Occidental reviewed its records and talked to plant personnel in early 1981 in an

effort to characterize materials that were dumped off-site since 1950 (616). Estimates of "typical concentrations" of certain key constituents were calculated, based on infrequent spot checks using sampling and analytical methods that were accurate at the time, but are no longer considered precise (616).

The first waste that was dumped was slurries that contained approximately 25% solids. The material was primarily inorganic salts of calcium (hydroxide and chloride). These solids contained fractional percentages of asbestos (0.1%) and chlorinated organics (0.4%). Trace levels of lead (50 ppm) and copper (10 ppm) were also detected in the solids, but cadmium and mercury were not detected (617).

The area surrounding the dock face was dredged on several occasions. Dredges containing volatile solids were disposed of in Commencement Bay until 1974. Following this, the spoils were disposed of at the "Oline" and "Dauphin" sites. The material was characterized as a thick slurry of approximately 25% solids and 75% seawater (616). Analysis at the time found that the solids were composed of approximately 8% volatile materials, 18% COD, and 1.4% salt (616). Contaminants in the material included chlorinated organics (50 ppm), oil and grease (0.5%), asbestos (0.2%), and a number of heavy metals including Pb (150 ppm), Cr (20 ppm), and Cu (50 ppm) (616).

The most significant of the off-site disposal sites was the Marine View Drive Site, also known as the General Metals Site (1055). This site was located on the north side of Marine View Drive, in the vicinity of Highline Road. Brine sludge with asbestos waste was deposited on the site from 1972 to 1977, when Don Oline owned the site. Stripper lime sludges from the production of TCE and PCE were deposited on the site between June 1972 and May 1973 (894). There was a layer of sludge approximately five feet thick spread over an area approximately 75 by 150 feet. This material was later covered with 7 feet of fill that consisted partly of shredded car interiors from General Metals. According to Ecology, pure sludge contained up to 40,000 ppm of TCE and PCE, plus copper, lead, asbestos and strontium. Approximately 600 tons of material was disposed at the site, consisting of a 25% to 30% slurry from the 1972 lime ponds.

In 1984, Conestoga Rovers and Associates drilled four groundwater monitoring wells and analyzed groundwater and surface water samples for TCE, PCE, and chloroform (894). Only the well that was drilled directly into the area of the sludge was significantly contaminated. This well contained both TCE (10,200 ppb) and PCE (2,500 ppm). Based on what it called "limited information," Ecology concluded that it did not appear that these chemicals were entering the Hylebos (894).

# b) Other Potential Sources of Contamination

# i) Storage of Waste Chlorinated Solvents

As a service to its major customers, Hooker pressure tested chlorine piping systems with trichloroethylene. Between April 1978 and August 1979, drums of waste chlorinated solvents were stored in the Northwest quarter of the plant site. There were up to 70 or 80 55-gallon drums at one time, and the storage area had no containment or sealed surface. In 1979, Ecology observed 70 to 80 drums that were all in serious

deterioration (1045). The substances stored in this area included TCE, PCE, mixtures of TCE and PCE, and 1,1,1-trichloroethane.

# ii) Fuel Oil Storage

Occidental stored significant amounts of #2 and #6 fuel oil. Fuel oil and diesel oil were burned for heating fusion pots (938). According to a 1987 inspection report, the company had between 50-60,000 gallons of #6 fuel oil. In addition, the plant had several diesel storage tanks, including a 1,000-gallon tank, a 500-gallon tank, and several smaller tanks (1028).

During an Ecology inspection in 1993, inspectors found a number of problems with the portable diesel fuel and gasoline tanks. The tanks had recently been moved from another location on site, and two 500-gallon tanks had visible rust, but were somewhat contained within a steel tray. Ecology noticed that the diesel spill containment tray had water, diesel and soiled spill pads in it. According to the report, "Dieselage spill was evident on the ground...this is not a good situation" (901).

#### iii) Laboratory and Shop Area

According to the plant RCRA Part B application, the plant generated "various laboratory chemicals" at its laboratory and shop area (1063). Historical disposal of these contaminants is unknown.

#### iv) Transformers

The plant's RCRA Part B Application shows at least five areas of the site that had transformers with PCBs (1063). The plant also had mercury arc rectifier and the plant lists "mercury contaminated residues and equipment" as one of the hazardous wastes it generated (1063, Table 5).

# 5). SIGNIFICANT SPILLS, RELEASES AND NPDES VIOLATIONS

#### a) Releases Before 1981

Before 1981, there were no requirements to report releases of chemicals to the environment, but plant shift supervisor records that show unknown quantities of TCE, calcium chloride and hydrochloric acid were released to the ground (for a list see Table 3 of Doc. 1063).

#### b) Fish Kills

On September 28, 1970, Ecology officials investigated a fish kill in the Hylebos. At the time, approximately 800 adult silver salmon and steelhead were migrating through the waterway and up Hylebos Creek to spawn each year. The officials suspected Pennwalt or Hooker. Hooker reported 13 chlorine violations in November alone of that year. In the months and years that followed, more and more evidence was discovered that Hooker might have been responsible for numerous fish kills. On July 28, 1982, Bob Hartman (Occidental) reported that he counted about 12 dead fish, but noted that sea gulls were quickly picking them up (771, 772). The plant's effluent had pH readings between 6 to 9 during the spill. A follow-up report by Occidental concluded that the fish were likely killed by an illegal discharge of sodium hypochlorite from the plant. This discharge was the result of sodium hydroxide being sucked out of the S-3 cell circuits' emergency vent scrubber into the chlorine unit condensate collection and chlorine stripping equipment. Grab samples taken on 07/28/82 found total residual chlorine at an estimated concentration of 10 ppm.

On September 22, 1984, the No. 1 bleach tank overflowed for approximately 10 minutes, spilling approximately 3,000 gallons of 25% sodium hydroxide on the grounds of the plant (649 and 650). According to an Occidental report, "it was dark at the time of the incident," and it is estimated that 50 gallons reached the Hylebos, but this "must be viewed as an approximation" (649). Some of the material overflowed a berm and entered the Hylebos. According to an Occidental report, "During a subsequent inspection of the area of the incident, between 12 to 24 dead fish were seen in the waterway near the area of the incident" (649).

# c) Chlorine, Caustic Soda, and Sodium Hypochlorite

Jan. to Aug. 1982 (774)	There were 17 NPDES permit excursions for chlorine residual in eight months.
<b>09/15/82</b> (1075)	5,000 gallons of 10-15% caustic soda spilled at the cell liquor storage area. Approximately 2,000 gallons entered ground and 3,000 gallons entered the effluent.
07/23/84 (793, 794)	There was a spill of approximately 300 gallons of 18% caustic soda to the ground from the No. 3 disposal tank that is used to scrub vent gases from the chlorine production process. Between 50 and 75 gallons of the material was recovered.

09/22/84	(	10	7	5)

3,050 gallons of caustic soda spilled in the Bleach area. Fifty gallons reached the waterway.

02/08/85 (645)

This release was due to a pump failure. Concentrations of chlorine residual were elevated to as high as 4 ppm. There was a total amount of 9 pounds of chlorine discharged. There was "no apparent environmental damage," according to a report.

07/06/86 (704)

The company's #3 disposal tank (a tank in which vent streams from the chlorine process are neutralized with sodium hydroxide) foamed over. This resulted in a spill of approximately 1300 gallons of sodium hypochlorite, 250 gallons of which went over the asphalt spill containment berm and entered the Hylebos. A sample showed that this material contained a pH of 11.2, 6 gpi of sodium hypochlorite (NaOCl) and 24 gpl of sodium hydroxide (NaOH). Occidental found that this translated into a discharge of 12.5 pounds of sodium hypochlorite and 50 pounds of sodium hydroxide.

12/86 (968)

There was a violation of the plant's permit limits for Total Residual Chlorine due to treatment equipment failure.

04/19/89 (693)

Caustic soda was released from their outfall. Occidental reported that it was due to a malfunctioning overfill gauge.

05/30/90 (905)

The plant experienced a partial loss of incoming electrical power, which caused an H-4 electrolytic cell circuit and a seawater supply pump to trip off line. This led to a release of approximately 24 pounds of total residual chlorine (based on a 24 hour sampling time) from the chlorine process stripper (the chlorine was dissolved in the plant's effluent. The company's NPDES permit limited its allowable maximum for total residual chlorine to 14.2 pounds in a 24-hour period.

12/20/90 (916)

Cold weather caused a flow transmitter in the chlorine stripper to malfunction, reducing the stripper efficiency and allowing a higher than normal discharge of total residual chlorine (TRC). Approximately 18 pounds of TRC were released (the NPDES permit limit was 14.2 pounds).

08/15/91 (926)

An underground steel line that was transferring 50% sodium hydroxide developed a small hole. The soil and asphalt that

	from 12.4 to 13.1.
08/27/92 (973)	The plant released 35 pounds of total residual chlorine. This release occurred as a result of an operational failure of the stripping unit.
12/25/94 (942)	The plant discharged wastewater with 300 ppb chlorine (the company's NPDES permit limit was 35 ppb) due to an instrument malfunction. Approximately 7 pounds of chlorine were released.
03/17/95 (955)	Ecology reviewed the company's December, 1994 Discharge Monitoring Reports and found that the No. 2 outfall had a sample measurement of 310 ppb for chlorine, almost ten times the company's NPDES permit limit of 35 ppb.
d) Oil	
12/12/78	Hooker was testing pipelines when they discovered a leak going into ground and leaching into the waterway. The plant supervisor said about 10-15 gallons of diesel and Bunker C spilled.
09/17/82 (776)	A line blew causing a release of approximately one quart of hydraulic fluid.
02/22/84 (787, 789)	Cooling coils in a 'pusher' located in the caustic house broke, releasing approximately two gallons of oil (Mobil DTE Oil Heavy Medium) into the collection system. The effluent was sent to the Hylebos waterway. Absorbent oil booms and curtains were placed in the waterway.
06/01/84 (791, 792)	During repairs of a joint in the plant's effluent system piping, approximately 7,200 gallons of wastewater and one pint of lube oil was discharged into the Hylebos. The water was from the Ammonia Plant, Muriatic Acid Plant and Brine processing areas. Less than 0.1 pound of ammonia was discharged. The pH ranged from 3.0 to 7.2. Absorbent oil booms and pads were placed in the waterway to contain the discharged oil.

was excavated from the area contained pH values ranging

#### 09/16/94/944

An oil sheen measuring 25 by 100 yards was discovered on the banks of the property. Occidental estimated that 3 to 5 gallons were reason. An investigation was conducted and it showed that Occidental was the probable source of the oil. The oil type found on the Hylebos chemically matched the oil used in the caustic evaporation system and elevated levels of oil were detected in the company's discharge mixing box immediately following the discovery of the oil sheen.

## e) Metals

02/12/84 (786, 788)

An underground pipeline ruptured, carrying brine from the salt pad to the brine processing area. Between 6,000 and 10,000 gallons of salt brine flowed out of the containment area, down a road and into an onsite surface storm drain and out to the Hylebos. A total of approximately 4.5 to 7.3 pounds of lead was discharged (which according to the law is a Dangerous Waste).

12/87 (968)

The company violated its permit limits for lead twice due to heavy rains that caused a brine pile slide and a recycle pump failure.

03/20/91 (911)

At approximately 9:30 AM, a flange gasket in the recycle water pipeline dislodged and an estimated 50 to 100 gallons of recycle water with a pH of 12.8 entered the Hylebos. A sample was found to contain lead (2.2 ppm) and sodium hydroxide (0.6% weight). Based on this sample, it is likely that 100 pounds of sodium hydroxide and less than 0.01 pounds of lead were discharged.

4/94

In April 1994, the company violated its NPDES permit limit for average total lead loading. A value of 1.6 lbs./day was reported, an exceedence of 0.4 pounds/day (958).

#### 6). COURT ACTIONS

#### a) Orders

1981 Order No. 81-153 (1357, 1358)

This order was given on January 23, 1981. Hooker was ordered to remove all soils in the unsaturated zone contaminated with

chlorinated organics at a level greater than 150 ppm except in one area. Hooker was also required to cover with a relatively impermeable material all areas of the plant where there was a mean concentration of chlorinated organics in the unsaturated zone exceeding 15 ppm. The plant was required to conduct groundwater monitoring and a monitoring program for Hylebos surface waters.

An amendment was made on May 12, 1982. Hooker was ordered to monitor groundwater wells 1,4 and 7 for TCE, PCE, chloroform, and dichloromethane. It was also required to sample the Hylebos twice a year.

1987 Order No. 87-S105 (505)

This Order regarded TCE contamination.

1993 Order No. DE 93WQ-S190 (966)

This order was issued as part of a settlement which addressed Ecology's monitoring program for the plant's NPDES discharge. Occidental was required to conduct a baseline comprehensive study. which included conducting chemical, and biological analyses of sediment samples taken near the outfall. The company was also required to analyze the particulate fraction of the effluent from each wastewater outfall, and perform a study to evaluate alternatives to reduce the amount of total residual chlorine in the effluent

1997 Administrative Order on
Consent for Removal Response
Activities (EPA Docket No.
10-97-0011-CERCLA)
(Draft) (2748)

A draft order was finished on 06/06/97. The work to be performed included sampling and analysis of the embankment area which extends onto the PRI Northwest property and the 5106 area, and work plan for removal actions.

# 7). SEDIMENT AND GROUNDWATER EVIDENCE OF CONTAMINATION

#### a) Introduction

A number of contaminants have been found in the property's groundwater and there is evidence these contaminants made their way to the Hylebos. When high tides take place, maximum ocean backpressure is exerted on the aquifer, the water table rises, gradients reverse, and groundwater is forced to move landward until the next low-tide gradient reversal permits it to flow seaward. According to one report, under such tidal influences, any pollution contained in the aquifer "must follow a similar migration pattern from the initial point of entry to its eventual surface-water discharge area" (1361).

#### b) VOCs

There is considerable evidence of chlorinated ethene contamination of the sediments, groundwater, and surface water near the facility. In 1982, a memo written by a Hooker employee reported concentrations of chlorinated ethenes as high as 69,000 ppb in intertidal sediments along the southern shore of the Hylebos about 3,160 feet from the mouth. In 1984, Ecology found concentrations as high as 350,000 ppb in the same area. Four additional samples were taken by Occidental in 1984 and results found PCE at concentrations up to 19,000,000 ppb in samples taken 3,300 feet from the mouth. Only one subsurface volatile sample was taken from this area during the 1985 Remedial Investigation. It had a total chlorinated ethene concentration of 33,000,000 ppb. The largest identified source of chlorinated ethenes to the Hylebos during the Remedial Investigation was from Occidental's groundwater (TTIb, 7.53). It contributed an estimated load of 6 lbs./day of chlorinated ethenes, of which 1.5 lbs./day was PCE with the remainder being TCE. One of the other largest sources of chlorinated ethenes was the plant's main effluent, which contributed an estimated load of 0.65 lb./day, a calculation based on a grab sample of 5 ppb that was taken during an Ecology Class II Survey in 1980 (TTIb, 7.53). These substances were also found in high concentrations in the water column. Sampling conducted in 1984 found TCE at concentrations as high as 230 ppb and PCE at concentrations as high as 72 ppb.

Chlorinated ethenes have been found in the saturated zone from 24 to 115 feet beneath the facility at concentrations up to 529,000 ppb. Tetra Tech estimated that there were between 19,000 and 35,000 pounds of chlorinated organic compounds in the saturated zone beneath Occidental, of which 10,000 to 16,000 pounds were chlorinated ethenes. According to Tetra Tech, in 1985, the daily loading of chlorinated organic contaminants of concern to the Hylebos from Occidental was more than six times that of any other source along the waterway (TTIb, 7.112).

September, 1979 (654)

A Class II compliance monitoring inspection was conducted by Ecology. Organic and metals analyses were conducted for Hooker by Can-Test. The stripper effluent contained bromoform (3 ppb) chloroform (28 ppb), PCE (30 ppb), dibromochloromethane (17 ppb), HCB (30 ppb), and HCBD (9 ppb).

August 1980 (1360, 1361)

Walker Wells completes their Phase II study. Thirty-four different points within the old solvent plant were sampled from land surface to the water table in order to get an understanding of chlorinated organics within the unsaturated zone. Sodium hydroxide was found in two test samples at concentrations of 3,700 ppm and 8,000 ppm (1361).

Chemical loading calculations were made in order to obtain an estimate of the total amount of chlorinated organics that may be leaving the solvent plant area through the groundwater flow system. Walker Wells used the values of 497 and 672 ppm, the maximum levels found during the study, at the center of the area that was the primary source of this material on the property. The final chemical load calculations showed that between 9 and 24 pounds of chlorinated organics were leaving the solvent plant each day, along with 50 to 110 pounds per day of sodium hydroxide from the caustics building complex. The sampling also indicated that as much as 18,550 pounds of organics may be located in the soils within the unsaturated zone.

Some of the organics detected in the samples include chloroform (23,000 ppb), trans-1,2-dichloroethylene 19,000 ppb), methylene chloride (6,900), 1,1,2,2-tetrachloroethane (4,500 ppb), 1,1,2,2-tetrachloroethene (8,600 ppb), 1,1,2-trichloroethane (14,000 ppb), trichloroethylene (14,000 ppb).

October 1980

Following this study, Hart-Crowser hydrogeologists sampled 35 additional test pits and auger holes in order to refine their original estimates of the organic concentration within the unsaturated zone under the old solvent plant. According to Walker Wells, this information proved that the Phase II study considerably overestimated the amount of chlorinated organics within the unsaturated zone. The supplemental study found that only approximately 10,775 pound of organics were contained within the zone (42% less).

1982 (1331)

Samples taken from monitoring wells in February found TCE at concentrations of 67, 246 and 328 ppb and PCE at concentrations of 13, 34, and 121 ppb.

1982

In 1982, a memo written by a Hooker employee reported concentrations of chlorinated ethenes as high as 69,000 ppb in intertidal sediments along the southern shore of the Hylebos about 3,160 feet from the mouth.

April 1984 (1020)

Bank and water sediment samples were taken at Occidental by Ecology. Bank seepage was tested and tetrachloroethane was detected (400 ppb) as well as lower levels of several other chlorinated hydrocarbons. PCE was not detected in intertidal sediment samples taken at the site, but there were very high concentrations of TCE (350 ppm) and hexachloroethane (640 ppm). Four additional samples were taken by Occidental in 1984 and results found PCE at concentrations up to 19,000,000 ppb in samples taken 3,300 feet from the mouth.

December 1984

Sampling was conducted as part of Occidental's request to dredge near Dock No. 1. Forty-seven samples were collected. A number of volatile organics were found (maximum concentration in parentheses): dichloroethylene (144 ppm), 1,2 transdichloroethylene (989 ppm), chloroform (17.1 ppm), and TCE (3,030 ppm).

1985

Only one subsurface volatile sample was taken from this area during the 1985 Remedial Investigation. It had a total chlorinated ethene concentration of 33,000,000 ppb.

June 1989 (1382 and 1393)

Occidental completed a marine sediment sampling and analysis program to characterize pollution near the plant. The purpose was to define the extent of the impact from release of hazardous substances. There was a controversy because the detection limits reported by the laboratory were higher than the CB/NT sediment cleanup objectives for semivolatile organic compounds and pesticides/PCBs. Of the organics found, Station C-1 was heavily contaminated with a number of organic contaminants including tetrachlorobutadienes (220,000 ppb), TCE (33,000 ppb), PCE, (7,900 ppb), chloroform (32,000 ppb), and pentachlorobutadiene (46,000 ppb).



1985

The 1985 Remedial Investigation by Tetra Tech found that PCB contamination in the Hylebos was patchy, but was generally highest along the south shore of the waterway (the side Occidental is located on). There were very high detection limits (1,000 ppb) due to the numerous chlorinated compounds in the area, but four stations taken 3,400-4,700 feet from the mouth of the waterway found concentrations of 420 ppb.

1986 (174)

A sample taken from an Occidental seep had the highest PCB concentrations found in intertidal sediments of the Hylebos Waterway. This sample was taken below the old Occidental solvent plant and had a concentration of 1,800J ppb d.w.

1989

Occidental completed a marine sediment sampling and analysis program to characterize pollution near the plant. Section VB (Corrective Action for Past Practice) of the Occidental's permit for the storage of Dangerous Waste required sampling of the Hylebos. The purpose was to define the total area impacted by releases of hazardous substances. There was a controversy because the detection limits reported by the laboratory were higher than the CB/NT sediment cleanup objectives for semivolatile Organic Compounds and Pesticides/PCBs. No PCBs were detected in any surface grab or sediment core sample.

#### d) Chlorinated Benzenes and Butadienes

According to Tetra Tech, chlorinated benzene is a by-product in the manufacture of chlorine gas by electrolysis of brine (TTIb, 7.59). HCBD is used to recover chlorine from "snift gas" (TTIb, 7.59).

1979 (654)

A Class II compliance monitoring inspection was conducted by Ecology. Organic and metals analyses were conducted for Hooker by Can-Test. The stripper effluent contained HCB (30 ppb) and HCBD (9 ppb). 1980 (TTIb, 7.56, 7.62)

The seven steel pipes (HY-085) had 1.2-dichlorobenzene and 1.3-dichlorobenzene at a concentration of 11 ppb.2 Groundwater studies by Hart-Crowser and Walker Wells in 1980 found HCBD in Well #4 at concentrations up to 960 ppb.

1981 (TTIb, 7.43)

Occidental sampled sediments in Segment 5 from the southern shore to the central channel. Total chlorinated butadiene concentrations ranged from 1,900 to 25,000 ppb at approximately 3,200 feet from the mouth. Subsequent studies found even higher butadiene concentrations offshore (up to 47,000 ppb).

1984 (1020)

Bank and water sediment samples were taken at Occidental by Ecology. A number of chlorinated butadienes were found in the Occidental sediment samples including tetrachlorobutadiene (1.0 ppm), pentachlorobutadiene (1.3 ppm), and HCBD (20 ppm) (this was the highest concentration of HCBD ever reported in Commencement Bay at that time).

According to Tetra Tech, HCBD was widely distributed along the south shore of the Hylebos. Four samples taken near the Occidental docks in 1984 found HCBD at concentrations from undetected (1,000 ppb) to 100,000 ppb) (903)

1985

The Remedial Investigation found that the distribution of chlorinated benzenes and butadienes in the Hylebos suggests a source of these substances about 4,000 feet from the mouth of the waterway. (TTIb, 7.43)

1988 (SEA, 1995)

HCBD was detected in levels over five times the Commencement Bay Sediment Quality Objective (11 ppb) in two of eleven surface samples taken by Weston for Occidental (620 and 760 ppb). Another sample had an estimated concentration of 83 ppb, but the remaining eight samples could not be evaluated because of the high detection limits (75 to 450 ppb).

HCB was also found in one sample of the eleven samples at a concentration of 880 ppb, approximately 40 times the SQO (22 ppb). Two other samples showed elevated levels (150 and 340 ppb), but were qualified as estimates.

1989 (1382 and 1393)

Occidental completed a marine sediment sampling and analysis program to characterize pollution near the plant. Section V.B (Corrective Action for Past Practice) of Occidental's permit for the storage of Dangerous Waste required sampling of the Hylebos. The purpose was to define the area impacted by releases of hazardous substances. There was a controversy because the detection limits reported by the laboratory were higher than the CB/NT sediment cleanup objectives for semivolatile Organic Compounds and Pesticides/PCBs. Station C-1 was heavily contaminated with a number of contaminants including HCBD (5,200 ppb) and HCB (570 ppb).

#### e) Metals

1979 (654)

A Class II compliance monitoring inspection was conducted by Ecology. Organic and metals analyses were conducted for Hooker by Can-Test. The plant had a net contribution (after subtracting the concentration of these substances in the saltwater influent) of 32.3 lbs./day of nickel and 16 lbs./day of chromium.

1980 (TTIb, 7.109)

The RI showed that a sample taken of the seven steel pipes discharging from the site had a concentration of 5 ppb of mercury.

1984

Sampling was conducted as part of Occidental's request to dredge near Dock No. 1. Forty-seven samples were collected. A number of heavy metals and volatile organics were found (maximum concentration in parentheses): mercury (0.56 ppm), cadmium (1.0 ppm), copper (160 ppm), lead (580 ppm) and zinc (220 ppm).

1983 (TTIa, pg. 43)

The Data Evaluation and Preliminary Study Design Report by Tetra Tech shows that Occidental was discharging 1.13 lbs/day of arsenic, 8.9 lbs/day of chromium, 3.4 lbs/day of copper, 9.4 lbs/day of lead, 1.3 lbs/day of selenium, 1.3 lbs/day zinc, and 4.4 lbs/day of organics from its main effluent outfall, groundwater seeps and stormwater discharges.

1985 (TTIa and 1361)

Tetra Tech's Remedial investigation found a number of chemicals within Segment 5 (the mouth of the Hylebos) that exceed the apparent effects threshold (AET). Mercury was

highly elevated at Station HY-40 (3.2 ppm). An intertidal sample found copper and zinc at 360 and 263 ppm, respectively. Lead concentrations were elevated near Occidental's Dock 1 and approximately 4,000 and 4,300 feet from the mouth of Hylebos Waterway. The dock had an intertidal sediment sample with a concentration of 486 ppm. The second site had concentrations of 3,560 and 231,000 ppm. Tetra Tech also found a sample with elevated levels of mercury at Station HY-40 near the plant (3.2 ppm), approximately 4,700 feet from the mouth of the waterway (903 and TTIb, 7.106). A sample taken of the discharge from the plant's stormwater drain (HY-085) detected mercury (5 ppb) (TTIb, 7.109).

Tetra Tech's Remedial investigation found a number of chemicals within Segment 5 (the mouth of the Hylebos) at concentrations that exceeded the apparent effects threshold (AET). HPAHs and LPAHs were found at 5,200 and 12,000 ppb, respectively, at a mid-channel station. Benzyl alcohol (130 ppb) was found at Station HY-41 and phenol was detected at 420 and 350 ppb, at stations HY-42 and HY-43, respectively.

1989 (1382 and 1393)

Occidental completed a marine sediment sampling and analysis program to characterize pollution near the plant. Section V.B. (Corrective Action for Past Practice) of Occidental's permit for the storage of Dangerous Waste required sampling of the Hylebos. The purpose was to define the extent of the impact from release of hazardous substances. There was a controversy because the detection limits reported by the laboratory were higher than the CB/NT sediment cleanup objectives for semivolatile Organic Compounds and Pesticides/PCBs.

The only priority metal that exceeded the sediment cleanup objective (SQO) was zinc at Station SS-5 (1,100 ppm), but copper was found at concentrations up to 150 ppm and lead was found at concentrations up to 98 ppm.

## f) Other Contaminants

## i) Hexachloroethane (903)

This substance was reported as "non-detectable" in the influent, but was measured as high as 291 ppb in the groundwater.

## ii) Cyanide (903)

This substance was reported as less than 10 ppb in the influent, but was measured as high as 210 ppb in the groundwater.

## iii) Pentachlorophenol (PCP) (938)

Soils samples ranged from 1.5 to 9.3 ppm for pentachlorophenol in area 1 near the Waste Pile Building. Occidental indicates that it believes that the PCP contamination is from historic use and storage of wood preservatives at the plant in this area. Because it was below the human health-based criteria level of concern (500 ppm), it did not require corrective measures by the EPA.

#### iv) DDT/DDD/DDE

During pre-remedial design activities, Occidental's intertidal bank area was sampled and found to have 4,4' DDD (at concentrations as high as 23,000 ppb –over 1,438 times the SQO), 4,4' DDE (at a concentration 856 times the SQO) and 4,4' DDT (at a concentration 647 times the SQO) (2748).

#### 8). SITE REMEDIATION

In January, 1981, Ecology ordered Occidental (Order No. DE 83-153 and Order No. DE 83-153, First Amendment) to remove soils contaminated with chlorinated organic compounds in concentrations in excess of 150 ppm (687). Between April and May of that year, approximately 2,000 yd<sup>3</sup> of contaminated soil was removed from the plant. Excavated areas were filled wit clean soil and capped with an asphalt cover (687). A 1989 EPA report indicated that studies had determined that surface water runoff from the plant grounds no longer contained measurable quantities of chlorinated organics or heavy metals.

After the removal of the contaminated soils, groundwater quality was monitored on a quarterly basis by Occidental. PCE and other chlorinated hydrocarbons actually increased in concentration, and in 1985, Tetra Tech noted that "in general, the soil

removal ordered by WDOE has not resulted in a noticeable improvement in groundwater quality (TTIb, 7.63).

In August 1993, Occidental started a \$25 million cleanup program. This program included constructing thirty wells to pump contaminated groundwater. The pumps will operate for 20-30 years, pumping groundwater up, treating it and removing toxic solid wastes. According to newspaper reports, the waste removed will be converted to hydrogen chloride and used in the plant's chemical manufacturing operations (1384). In February 1997, the Pierce County Superior Court approved an Occidental agreement with Ecology and the Bonneville Power Administration over the cleanup of sludges and soil at the BPA's property near Taylor Way and Marine View Drive. The sludges will be excavated and contained on a portion of the site (Schrieve, 1997).

# K. PRI NORTHWEST

# 1). INTRODUCTION

The PRI Northwest site is 4.4 acres in size and is located at 709 Alexander Avenue (2610). It is bordered by Alexander Avenue to the southwest, Occidental Chemical Corporation to the Northwest, the Hylebos to the northeast and a Port of Tacoma property to the southwest (2610). The site has been used as a bulk petroleum fuel storage and distribution from the 1930s to the 1980s. The Fletcher Oil Company bought the property in 1931 from Norton Clapp (2728) and began operations at the property in 1934 (the company also had offices at 401 and 606 Alexander Avenue) (2602). It distributed wholesale petroleum products from the site (2717). Fletcher Oil Company was a partnership, with F.O. Fletcher, Inc. being the minority partner and D.S. Fletcher, Inc. (later known as Fletcher Oil and Refining Co.) being the majority partner (2728). The majority partner went bankrupt around 1988 (2728).

A number of different owners operated bulk storage facilities at the neighboring Port of Tacoma property, including Fletcher and PRI. Department of the Army records show that the site, including its petroleum tanks, was purchased in 1951 from General Petroleum Products for use as an Air Force fuel distribution terminal, and in 1965, a small portion along the waterway was sold to the Navy Reserve (2682). The Air Force used the site as a bulk petroleum depot. Ecology obtained a 1983 aerial photo of the mouth of the Hylebos that indicated that the site had a bermed area around one of the tanks with brown-stained soil within it (2682). The remainder of the site, including petroleum tanks was sold to the Port of Tacoma on August 30, 1966 (2682). Fletcher Oil leased three of the four fuel-receiving tanks at the property from April, 1972 through 1980 (2649).

PRI Northwest (PRI), a subsidiary of Pacific Resources, Inc. took over operations of the 709 site in 1978 and purchased the property from Fletcher in 1982 (PRC, 1993 and 2602 2717). PRI also subleased the three fuel tanks at the Port of Tacoma property from Fletcher and then took over the property lease until 1983 (2649 and 2682). The bulk fuel storage tanks at the Port of Tacoma property were demolished in 1983 and the property was subsequently paved (2717). Water from an outfall on this parcel found lead (43 ppb), zinc (560 ppb), copper (49 ppb), and oil & grease (7 ppb) (2573).

There was also a tetraethyl lead (TEL) plant at the site from the late 1970's to the early 1980's (2610). It involved blending lead with gasoline to increase its octane content (2610 and 2717). PRI operated the plant in 1982 and 1983. An unknown party operated the plant before 1982 (2610). It was likely Tesoro Petroleum, which leased a portion of the site from May, 1970 to January, 1978 (PRC, 1993). Ethanol was handled at the site for 1 year in the early 1980's (2717).

United Independent Oil (UIO) operated a small topping plant at the site (a simple distillation to refine light crude oil) in the 1970s until 1983 (2602, 2610, 2717). Another report noted that it leased part of the property from 1972 to 1974 (PRC, 1993). UIO removed all its intact process equipment from the site before or during 1985 (2602).

Fletcher marketed diesel fuel while PRI Northwest was primarily a distributor of

gasoline, diesel fuel, and small quantities of fuel alcohol. In 1979, there was an explosion at the Hooker Chemical facility, which destroyed many offices and buildings along Alexander Avenue including those owned by Fletcher and PRI Northwest, but it did not rupture any of the tanks at the site (2602). PRI ended operations at the site in the mid-1980's (2610).

On August 5, 1997, OCC Tacoma, a wholly owned subsidiary of the Occidental Chemical Corporation acquired the PRI property (this followed the acquisition of the Occidental's plant at 605 Alexander Avenue by Pioneer on June 17, 1998) (2730). It also assumed all of the responsibilities of PRI for the fulfillment of Order No. DE 95TC-S242 (2736). This acquisition served three purposes. First, this allowed Occidental direct access to the property's embankment, which OCC Tacoma was addressing as part of an Administrative Order on Consent for Removal Activities with the EPA that was signed on November 7, 1997. Second, it was done to resolve the company's disputes with PRI Northwest, and finally, the company wanted to obtain the property for future use and development (2730).

A number of fuel-related contaminants have been found in the property's groundwater and soils. A soil sample in the middle of the site also contained significant amounts of PCBs. Groundwater flow at the site is toward the Hylebos, and these contaminants likely made there way to the Hylebos through groundwater discharge at seep near the dock, and through surface water runoff.

#### 2). CHEMICALS ASSOCIATED WITH LAND-USE

## a) Fuei Storage Tanks

A maximum of 14 above-ground storage tanks were located at the site in 1985, with tanks ranging from 500 to 35,000 barrels in size (2717). At one time, Fletcher had four above-ground 20,000-barrel tanks on the Port of Tacoma property (2602). The 709 Alexander Avenue property had four aboveground 5,000-gallon tanks on a concrete slab and five larger tanks that it leased to PRI Northwest. The tanks at the PRI site were filled by trucks or barges via aboveground piping. The four 5,000-gallon tanks were sold and removed from the site in 1989.

The tanks it leased to PRI rested on asphalt pads approximately the same diameter as the tanks. This area was positioned on an unlined sand tank bed that was surrounded by a 5-foot sand berm. There was a large quantity of shells in the sand that suggest it the material consisted of dredged marine sediments (2602).

The site also had two underground storage tanks. The first tank was a heating oil tank located near the PRI Northwest office building near Alexander Avenue (2602). The second was a 500-gallon tank that was used to hold lead waste (2602).

## b) Tetraethvl Lead (TEL) Drums Storage Area

An Ecology inspection in 1981 found approximately thirty 55-gallon drums of

highly poisonous TEL on a curbed concrete slab. There were at least two 6-foot areas without curbs (2578).

#### c) Occidental Wastes

An Ecology inspection of the site on 04/08/92 found graphite anodes on the bank of the Hylebos and rusted abandoned drums in the water (the drums were on the bank during the low tide) (2585). Tests of the drums revealed that it contained asphalt (2585). Ecology took soil samples of the fill material in 1992 (2570). They found lead 37,400 ppm, carbon tetrachloride (5 ppb), chloroform (20 ppb), HCBD (11 ppb), trimethylbenzene (20 ppb), PCE (9 ppb), and xylenes (11 ppb) (2570). A water bank seep sample was taken and found to contain lead (5,290 ppb), copper (96.7 ppb), zinc (228 ppb), DCE (33 ppb), TCE (35 ppb), and PCE (42 ppb).

In 1994, under the terms of Agreed Order No. DE 93TC-S301, PRI Northwest hired Hart Crowser to conduct a site investigation. This study revealed the presence of contaminants in a berm adjacent to the Hylebos. The berm consisting of a layer of backfill debris material with a sand matrix and varying amounts of concrete rubble, graphite anodes from chemical processing cells, rubber, metal, and ceramic fragments and other debris. The debris layer also contained a white fibrous substance with a sludge-like consistency. Graphite anodes were most concentrated at depths of approximately 3 to 5 feet (2610). The debris layer is contiguous with a landfill on the Occidental Chemical property from the 1920s to the 1970s (2610).

The southeast corner of the Occidental plant along the Hylebos was an area used for landfilling between 1929 and 1971, an area referred to as the "N Landfill." (2732). According to Hart Crowser, PRI's berm contamination was contiguous with and extension of Occidental's N Landfill. This conclusion was supported with aerial photographs that were taken in 1936, 1946, 1960, and 1974. These photographs showed the landfill running across the PRI property line (2678). This conclusion was later confirmed in a letter to Ecology by Occidental in May 1998, which noted that Fletcher allowed Hooker to place concrete and other debris on parts of the site's embankment as park of filling activity (2733).

The vertical extent of the backfill debris varies from 9 to 13 feet below grade with an average depth of 11 feet (2670). The debris extends along the length of the shoreline a distance of approximately 210 feet and extends upland an average thickness of 105 feet (2670 and 2734). The debris was determined to be in direct contact with the groundwater, since the depth to the groundwater below the ground surface is approximately 9 feet at the contaminated areas (2670). The total in-place volume of the backfill debris is 9,000 cubic yards, of which there is approximately 2,000 cubic yards of sludge, graphite anodes, and other industrial debris like rubber, metal, and ceramic fragments and concrete debris, with the rest being silty fill material (2670).

Groundwater and seep samples taken in 1994 showed that there were releases of TCE, PCE, 1,1-dichloroethene, and vinyl chloride from the site into the Hylebos (2696). A 1996 Conestoga-Rovers & Associates report entitled "PRI Source Identification Program Report" (2732) found that groundwater flows from the PRI property onto the

Occidental property and onto the PRI property from the Occidental property (2732). On September 23, 1994, Occidental was sent a notice by Ecology that they were a potentially, liable party for disposing process sludge at the site (2696).

#### d) Oil in Sewer Line

In September 1987, a contractor was overcome by fumes in the manhole of the main sewer sanitary line at 1220 Alexander Avenue (2597). Oil was found floating on the surface of the sewage at 845 Alexander (2597). The Tacoma Sewer Utility investigated and found that oil was infiltrating a portion of sanitary sewer line that runs along Alexander Avenue in front of the PRI property (2570). Workers dug down to the groundwater and found oily material visible on the groundwater surface. When it was skimmed off, oil continued to flow into the hole (2597). The leaking sewer line was fixed, but the source of the contaminants was not dealt with (2570).

Oil entered the sanitary sewer line in front of the Port of Tacoma property three other times after the 1987 incident (2681). Oil was discovered in the same section of the line in January 1991 and December, 1992 after a strong fuel odor was noted in an area business (2682). The last instance was in January, 1995. The oil was sampled by Ecology and determined to be extremely weathered #2 diesel. Each instance, the Tacoma Sewer Utility repaired the line to stop the infiltration. An Ecology official concluded in 1995 that the contamination is likely due to the Port of Tacoma site, because (1) groundwater samples at the PRI did not contain elevated levels of oil and grease (except very slight elevated levels at one site), (2) the fact that the infiltration was consistently downstream of the PRI site, (3) the fact that the Port site was known to deal in diesel while the PRI site specialized in gasoline, and (4) the aerial photos showing stained soils in 1983 (2682).

#### 3). SIGNIFICANT SPILLS, RELEASES AND NPDES VIOLATIONS

1979 (2602)	69 gallons of gasoline spilled.
1981 (2602)	An unknown quantity of Safety-Kleen (an aliphatic solvent) spilled.
1981 (2602 and 2578)	An Ecology inspection on 03/17/81 found a leaking valve on a line carrying gasoline and a leaking valve on a diesel tank.
1983 (2602)	300 gallons of diesel spilled into the ground.

## 4). COURT ACTIONS

1993 Order No. DE 93TC-301 (2585) The Order required PRI Northwest to

perform a site investigation, document the waste dumped in the site, and conduct soil and groundwater sampling

1995 Order No. DE 95TC-S242 (2670)

The Order was given to PRI Northwest Occidental and F.O. Fletcher (formerly Fletcher Oil). It ordered the PLPs to carry out remedial actions to stop the source of contaminants to the Hylebos. This included removal of contaminated soil closest to the waterway, the removal of graphite anodes and sludge-like material from the site, the installation of a groundwater extraction network and treatment of the groundwater at the Occidental groundwater treatment plant, the installation of a low permeability cap, and monitoring, and the installation of a vertical barrier to separate the remaining backfill from the waterway and prevent the discharge of contamination from groundwater seeps (2734). After OCC Tacoma purchased the property in August, 1997, (and at their request), Ecology dropped PRI as a party to the order (2734).

## 5). SEDIMENT AND GROUNDWATER EVIDENCE OF CONTAMINATION

#### a) Metals

#### i) Groundwater

1989 (2570)

An Ecology and Environment study included performing groundwater sampling. A number of metals were found (range) arsenic (2.5 to 90.8 ppb), chromium (8.8 to 160 ppb), copper (7.8 to 355 ppb), lead (43.6 to 654 ppb), lead (43.6 to 654 ppb), mercury (0.20 to 2.33 ppb), nickel (10.0 to 242 ppb) and zinc (50.0 to 2270 ppb).

1992 (2585)

On 04/08/92, Ecology inspectors collected random samples of groundwater seeps. The found total lead (5,290 ppb), PCE (42 ppb), total zinc (9.7 ppb), total copper (228 ppb), DCE (33 ppb) and TCE (35 ppb).

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An Ecology and Environment study found lead in one subsurface soil sample at 14.1 ppm and at 654 ppb in groundwater from the same sample location. The soil sample was taken immediately beneath the underground leaded waste tank that was removed just prior to sampling. The lead levels in the subsurface soils diminished with distance away from the tank pit.

## 1992 (2585)

On 04/08/92, Ecology inspectors collected random samples of fill material on the bank of the Hylebos along the site. They found total lead (37,400,000 ppb), carbon tetrachloride (5 ppb), chloroform (20 ppb), HCBD (11 ppb), trimethylbenzene (20 ppb), PCE (9 ppb), and xylene (11 ppb).

## 1994 (2716)

Ecology inspectors took soil samples with Hart Crowser as part of Order DE 93TC-S301. They found chromium (max. conc. 146 ppm), copper (832 ppm), lead (14,900 ppm), nickel (302 ppm), and zinc (276 ppm).

## 1994 (2610)

Hart Crowser's Preliminary Site Investigation revealed the presence of lead (ranging from 210 ppm to 28,000 ppm), copper (up to 1,200 ppm), mercury (up to 0.27 ppm), arsenic (up to 7.8 ppm), zinc (570 ppm), and nickel (200 ppm).

#### b) Occidental-Related Contaminants

Hart Crowser noted that that it believed that the TCE, DCE and vinyl chloride observed in PRI groundwater might be biotransformation products resulting from an upgradient release of PCE (2611A). Elevated groundwater pH (measurement of 10 to 11 were detected) and high chloride concentrations were also found on the PRI site, more evidence of Occidental (2611A).

#### i) Groundwater

1989 (2570)

A Ecology and Environment, Inc. study included performing groundwater sampling. A number of chlorinated hydrocarbons were found (range): vinyl chloride (10 to 270 ppb), 1,2-dichloroethene (DCE) (1 to 90 ppb), TCE (5 to 160 ppb), and PCE (5 to 1,100 ppb),

1994 (2716)

Ecology inspectors took soil samples with Hart Crowser as part of Order DE 93TC-S301. They found TCE 55.8 ppb), PCE (180 ppb), DCE (41.1 ppb).

1994 (2610)

Hart Crowser Preliminary Site Investigation found that eight VOCs which generally coincided with the distribution of SVCs including 1,4-dichlorobenzene, hexachloroethane (12 ppm), 1,2,4-trichlorobenzene (2.3 ppm), HCBD (2 ppm). HCB, pentachlorophenol, bis-(2-ethylhexyl)-phthalate, and carcinogenic PAHs including chrysene. benzo(b)fluoranthene. benzo(k)fluoranthene, benzo-aindeno(1.2.3-CD)pyrene, pyrene. and dibenzo(a,h)anthracene.

1995 (2611A)

A soil and groundwater investigation was conducted by Hart Crowser. The plumes suggest that the chlorinated hydrocarbon contamination of the groundwater may have originated as multiple slug releases from historical upgradient one-time point sources. PCE was the predominant chlorinated hydrocarbon detected. TCE and 1.2-dichloroethene (DCE) showed concentrations. TCE was measured to approximately 24 to 25 ppb and DCE ranged from 6 to 7 ppb. Hart Crowser believed that this trend of decreasing concentrations suggested that the plume might have downgradient.

ii) Soils

1994 (2716)

Ecology inspectors took soil samples with Hart Crowser as part of Order DE 93TC-S301. They found (max. conc. in parentheses): TCE (11 ppb), PCE (4,800 ppb), HCBD (780 ppb), chloroform (4,500 ppb), and methylene chloride (11 ppb).

## c) Petroleum Compounds

1989 (2570)

Groundwater sampling by Ecology and Environment, Inc. found a number of fuel-related substances in the wells near Alexander Avenue at the southwest and northeast corners (2717) of the site: toluene (1 to 350 ppb), ethylbenzene (2 to 120 ppb), benzene (2 to 2,500 ppb), and naphthalene

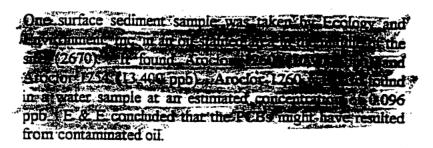
(110 ppb). These contaminants appeared to be more concentrated in groundwater at the southwest of the site. Other wells contained much lower concentrations of BTEX (2682). E & E concluded that these contaminants might represent components of petroleum spilled at the product transfer portion of the site.

1995 (2609)

Hart Crowser conducted an investigation of petroleum hydrocarbons at the PRI property, which included soil and groundwater sampling and sampling for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylene (BTEX) analysis. The pattern of TPH and BTEX concentrations is consistent with releases related to historical bulk terminal fuel storage and handling activities. TPH and gasoline concentrations in soil samples ranged up to 36,000 and 6,300 ppm respectively. These samples were collected at depths between 5 and 9 feet below grade. Benzene and total BTEX concentrations exhibited a similar pattern, with benzene concentrations up to 14 ppm. About 25 percent of the samples analyzed contained detectable In terms of lead, with concentrations up to 27 ppm. gasoline groundwater. the highest and concentrations were detected southwest of the former tanks area, near PRI property line with the Port of Tacoma property. Benzene was found in concentrations up to 5,170 ppb and gasoline was found in concentrations up to 14 ppm. The absence of higher concentrations closer to the tank suggested that the plume has migrated and degraded somewhat. Dissolved lead was found in three groundwater samples, and concentrations of 4, 5 and 350 ppb. The last figure was located on the berm.

# d) PCBs

K1989 (2602)#



## 6). SITE REMEDIATION

Aboveground petroleum storage tanks were cleaned in 1989 (2610). By April, 1989, all of the tanks at the PRI site had been emptied and were cleaned by a waste removal company. Four tanks were sold and removed and five tanks remained. In July 1989, one underground tank was excavated and removed. It was originally part of the gasoline leading facility and was installed to hold leaded wastes (2602).

Name of PRP

Site Address & Description

United States Naval and Marine Corps Reserve

1100 Alexander Avenue, Tacoma, WA

The Reserve Center property consists of approximately 9.03 acres and is composed of four pieces of property, three of which are owned by the Navy and one is leased by the Navy from the Port of Tacoma. January 1996, A Historical Survey of the Naval and Marine Corps Reserve Center, Tacoma, by U. R. S. Consultants at 1-1.

There are administrative and shop facilities located on one parcel of property. *Id.* 

Owner/Operator Status of PRP

The Naval and Marine Corps Reserve Center, Tacoma, occupies 9.03 acres of the former Naval Station Property. January 1996, A Historical Survey of the Naval and Marine Corps Reserve Center, Tacoma, by U. R. S. Consultants at 2-4. The Reserve Center has operated at the current site since the late 1940s. Id. The Reserve Center serves as host command for local Navy, Marine Corps, Army, and Coast Guard Training Units. Id.

According to Navy records, the property was acquired in 1943. Id.

Former & Subsequent Owners

The response to the 104(e) request by the U.S. Navy and the Port of Tacoma indicated the following history on 401\_ Alexander Avenue, on the Hylebos Waterway:

1917: Site developed by Todd Shipyards for production of World War I ships. 1925: Shipbuilding operations ceased. 1939: Todd Shipyards begins shipyard reconstruction.

1940-1946: Todd Shipyards constructed 74 ships for the Navy for World War II.

1945: Naval Station, Tacoma,

established at the site.
1948: Navy purchased all remaining shipyard property from Todd.
1959: Port of Tacoma purchased shipyard property from U.S.
Government.

June 11, 1993 memorandum from Paul Fuglevand, Dalton, Olmsted & Fuglevand, Inc. to Allison Hiltner, EPA.

Five of the Parcels from the former Naval Station, Tacoma, were acquired through condemnation of property then held by Evelyn Clapp, Tacoma Harbor Lumber Company, and (b) (6) One parcel 74.238 acres in size was acquired on March 12, 1948 through a land exchange with Todd Shipyards. Id. Approximately 33 acres of property was transferred on May 7, 1951 from the Department of Commerce. Id. Except for the small portion of the former Naval Station, Tacoma, which was retained by the Navy, the vast majority of the property was excessed on October 1, 1958. Id.

Former & Subsequent Operators

Records indicate that between 1917 and 1925, the property at the end of the peninsula bordered by Commencement Bay, the Hylebos Waterway, and the Blair Waterway was operated by Todd Shipyards for the production and repair of boats during World War I. January 1996, A Historical Survey of the Naval and Marine Corps Reserve Center, Tacoma, by U. R. S. Consultants at 2-1. In 1925, the shipbuilding industry declined and the shipyard area housed wood working plants. Id. With the escalation of World War II, Todd Shipyards once again came to life and in 1939, signed contracts with the Maritime Commission for five cargo vessels. Id. In 1942, the Maritime Commission cancelled its contracts and turned over control of ship production to the Navy, which established its own

contracts and built 74 ships between 1940 and 1946. *Id*.

In 1943, the Navy obtained control of all the property on the peninsula except Occidental Chemical, PRI Northwest, Inc., and General Petroleum Company, and developed the area to support the shipbuilding. Id. Based on aerial photographs, the Navy pier was most likely built between the late 1930s and early 1940s. Id. The fueling pier is assumed to have been operated by Fletcher Oil Company because of reports that the company received petroleum products by barge. Id. at 2-3. The fueling pier was acquired by the Navy in 1951. Id. The facility, Naval Station, Tacoma, was established in 1945 at the end of World War II, but Todd Shipyards remained as a contractor until March 1948, when the Navy purchased all shipbuilding facilities. Id. The shipyard provided berthing and deactivation, preservation and storage facilities for the Tacoma Reserve Fleet. Id. "The shipyard may have been used for dismantling and retrofitting of Liberty and Victory ships from about 1946 to 1948." Id. In 1943, the Navy also acquired the property which is currently the Reserve Center. Id. In the 1940s, this property was designated as Reserve property and used for training. Id. Not much is known about the operations at Naval Station, Tacoma, between 1946 and 1958. Id. In 1958, most of the Navy-owned property was reported to the General Services Administration as excess. *Id.* Three pieces of property totaling 8.33 acres were retained for use as a Reserve Center. Currently, the Navy leases .7 acre from the Port of Tacoma, for a total of 9.03 acres. Id. The current Reserve Center is located on these properties. *Id*.

Affiliates and Subsidiaries of Owners/Operators

Dates of Operation

Description of Operations

In December 1982, Naval Reserve Maintenance Training Facility ("NRMTF"), Puget Sound, became a tenant at the Reserve Center. [BARB – add cite]

The Naval and Marine Corps Reserve is related to the U.S. Navy.

From the late 1940s to present. January 1996, A Historial Survey of the Naval and Marine Corps Reserve Center, Tacoma, by U.R.S. Consultants.

The Navy maintains eight full-time personnel on-site to support reserve units and to provide training. January 1996, A Historical Survey of the Naval and Marine Corps Reserve Center, Tacoma, by U. R. S. Consultants, at 3-1. The Navy pier on the Hylebos was the homeport for two minesweepers. Id. Both were decommissioned on September 30, 1994, and are no longer moored at the Reserve Center. Id. The Navy pier is currently used to moor berthing barges from Puget Sound Naval Shipyard and provide temporary moorage for other vehicles. Id. The ships are provided with electrical, sewage, water, and, until 1984, bilge water hookups. Id. Until 1994, bilge water from boats moored at the Navy pier was pumped to an aboveground tank where it was stored until it was pumped out or removed by a commercial oil reclaimer. Id. at 3-2. Since the decommissioning of the minesweepers, the Reserve Center no longer handles bilge water. Id.

The historical survey of the Naval and Marine Corps Reserve Center completed in January 1996 indicates that the current Marine unit is a bulk fueling unit, although no fueling takes place or has taken place on the property. *Id.* The only maintenance conducted at the Reserve Center by the Marine Corps includes antifreeze changes and oil and

# Hazardous Substances on Upland Property

filter changes; other maintenance is conducted at Fort Lewis. *Id.* Less than 1,000 gallons of hazardous waste has been produced at the Reserve Center in the last four years. *Id.* 

The Reserve Center produces solid waste and some hazardous waste in the form of waste oil. January 1996, A Historical Survey of the Naval and Marine Corps Reserve Center, Tacoma, by U. R. S. Consultants at 4-1. Hazardous waste generated at the Reserve Center has included PCBs, oils, fuels, solvents, paints, and batteries. Id. In 1988, it was reported that the Reserve Center produced approximately 1,000 to 2,000 gallons of hazardous waste per year. Id. One PCB-containing transformer was reported on-site in 1982, but in a January 1986 report the transformer was reportedly removed and disposed of at an appropriate facility. *Id*.

Oily wastewater collected from the vessels was treated via an oil/water separator. Id. The oily water was collected in a 2,000-gallon tank and piped into the separator. Id. In 1986, the Navy removed five underground storage tanks. Id. at 4-3. The estimated capacities and ages of the tanks removed were as follows: two 10,900-gallon tanks, approximately 30 years old; one 23,200gallon tank, approximately 30 years old; one 48,000-gallon tank installed in 1982; and one 1,000 to 5,000-gallon tank, estimated to be 20 to 30 years old. Id. During the excavation of the underground storage tanks, soil samples were collected from the areas of relatively undisturbed soil and analyzed for total petroleum hydrocarbons. Id. at 4-4. Soil samples were taken and analyzed for total petroleum hydrocarbons. Id. The results from soil adjacent to the 12,000-gallon tank were 1,980.3 mg/kg and 350.7 mg/kg. Id. at 4-4. Tide related water was encountered

in an excavation pit. Id. Samples of this water were collected and an analysis showed a total petroleum hydrocarbon concentration of 485.3 mg/L. Id. After the excavation of the contaminated soils found in this area, additional water samples were collected and analyses indicated nondetected levels of total petroleum hydrocarbons. Id. at 4-4 and 4-5. The excavation of one underground storage tank approximately 4,000 gallons in capacity revealed visual signs of leakage from the tank. Id. at 4-5. After excavation, samples collected indicated nondetect levels of total petroleum hydrocarbons. Id. During a record search in 1981, several Navy reports and letters were found regarding PCBs at the Reserve Center. Id. at 4-5. One letter dated March 9, 1984, called for the disposal of a PCB-containing transformer. Id. Reports in 1983, 1984 and 1985 reported a 930 kg PCBcontaining transformer that was intact. Id. A report dated January 1986 reported the transformer was removed and disposed of in an appropriate facility. Id. It is unknown where this transformer was located. Id. During the records review which was conducted by a Navy contract, no documentation regarding PCB spills was found. Id.

According to annual reports, four oil spills totaling 15 gallons have occurred in the Tacoma area since 1972. *Id.* at 4-6.

The NRMTF operated the repair barge and the oily waste barge, which were moored north of the Navy pier, 65 feet from shore. January 1996, A Historical Survey of the Naval and Marine Corps Reserve Center, Tacoma, by U.R.S. Consultants. [BARB – check site] The oily waste barge was approximately 112 feet long and 34 feet wide, and contained six compartments. *Id.* Facilities on the repair barge included a

machine shop, valve and pump shop, welding shop, electrical shop, carpenter: shop, sheet metal and pipe shop, and sale lot. Id. The NRMTF repaired barges moved to the Puget Sound Naval Shipyard, Bremerton, Washington, in August 1988. Id. The oily waste barge remained at the Reserve Center. Id. In April 1994, samples of the contents of the compartments on the oily waste barge were collected. Id. During the sample collection, it was noted that compartments 2 and 5 contained sand and compartment 3 contained sand and thick oil; compartments 1 and 6 contained oily water, and compartment 4 contained miscellaneous debris. Id. Analysis of the samples showed that the water in compartment 1 contained Lead in concentration of 31 mg/L, which categorized the water as hazardous material. Id. at 2-4. Samples of sand from compartments 2 and 3 contained diesel and heavier petroleum fractions, in compartment at a concentration of 210 mg/kg, and in compartment 3 at a concentration at 3,000 mg/kg.

In July 1994, the waste was removed from the oily waste barge and each compartment was steam-cleaned until it was visibly clean. Id. Estimates of the amount of material removed from the oily waste barge were 170 cubic yards of dry and wet sand from compartments 2, 3, and 5; 4,910 gallons of oily water from compartments 1 and 6; approximately one gallon of oil from each compartment that was in the form of a thin surface layer; approximately five gallons of thick oil in a small oil pool and floating on water in compartment 3; and five cubic yards of trash in compartment 4. Id.

No information in files.

No information in files.

Other Evidence of Releases

Notices of Violation

Naval and Marine Corps Reserve, U.S., Operational Profile Page 7

Personnel/Witnesses

No information in files.

NOTE: See operational profiles for U.S. Navy and Todd Shipyards.

Naval and Marine Corps Reserve, U.S., Operational Profile Page 8

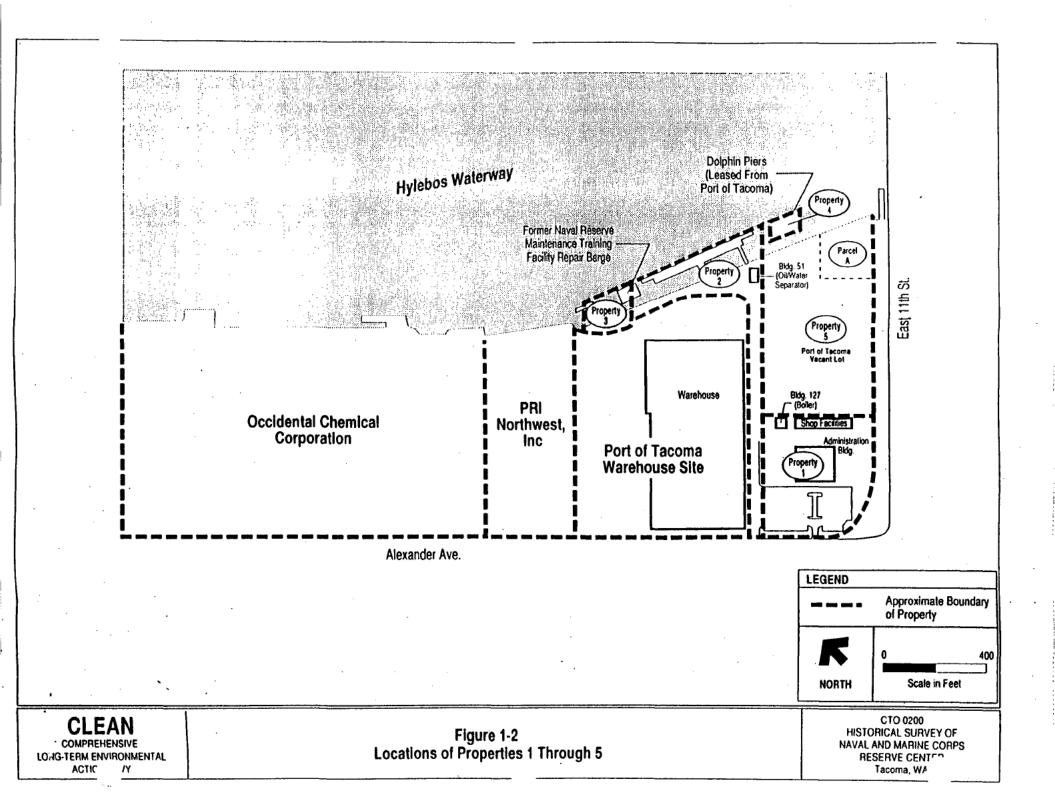
# HISTORICAL SURVEY OF THE NAVAL AND MARINE CORPS RESERVE CENTER, TACOMA TACOMA, WASHINGTON

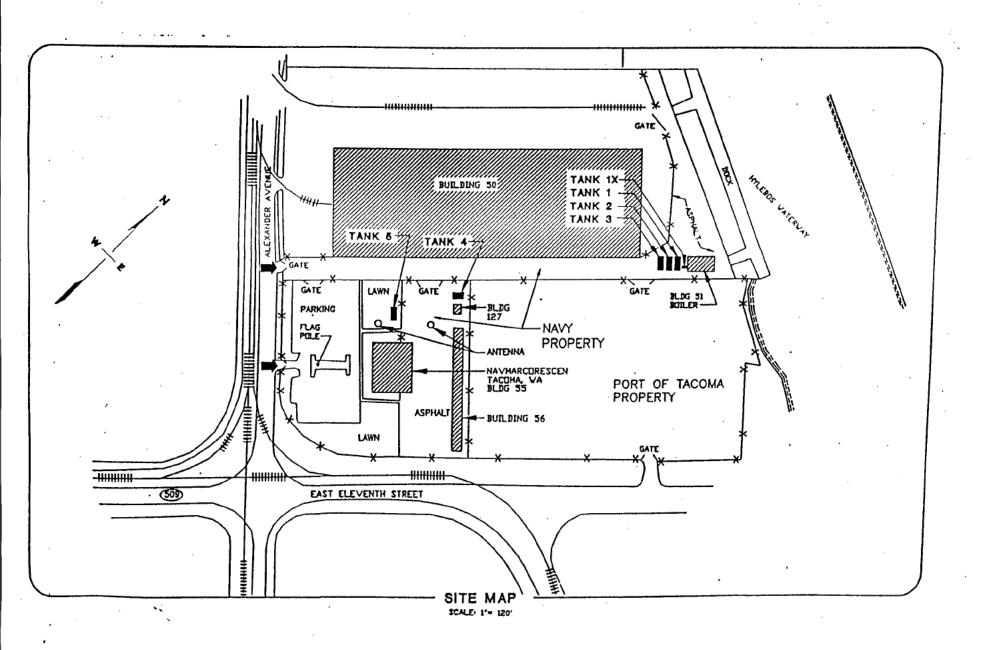
Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract, Northwest Area Contract Task Order 0200

Prepared by URS Consultants, Inc. Seattle, Washington

Prepared for
Engineering Field Activity, Northwest
Southwest Division, Naval Facilities Engineering Command
Poulsbo, Washington

January 22, 1996





HISTORICAL SURVEY, RESERVE CENTER, TACOMA U.S. Navy CLEAN Contract Engineering Field Activity, Northwest Contract No. N62474-89-D-9295 CTO 0200

Section 4.0 Revision No.: 1 Date: 01/22/96 Page 4-3

In 1993, a portable steam cleaner was used to clean motor vehicles and other equipment in various locations at the Reserve Center. The wastewater generated by the steam cleaning entered the stormdrain system, which discharges directly into the Hylebos Waterway (Delanie 1995). An automobile wash rack has been mentioned, but it is unclear whether the portable steam cleaner and the wash rack are the same piece of equipment.

### 4.4 POTABLE WATER

Potable water is purchased from the City of Tacoma. The water enters the Reserve Center through two water mains. One 6-inch line serves the pier area and one 2.5-inch line serves the upland area, which includes the administration building, shop area, sprinkler system, wash rack (no longer on site), and boiler plant.

### 4.5 ASBESTOS

From 1990 to 1991, the Navy conducted a survey of potential asbestos-containing material on site. The results of the survey confirmed that the administration building and shop facilities contained material with asbestos. In 1994, the Navy contracted with N.W. Construction General Contracting, Inc., to remove the asbestos-containing material. The administration building and most of the shop facilities have been remediated. The Navy stated that there was one area in the shop facilities that was scheduled to be remediated at the end of October or the beginning of November 1995. With the removal and closure of the USTs, all asbestos-containing insulating material was removed from associated piping. During the site visit on October 19, 1995, a vault was observed southeast of Building 51 on Property 2 that possibly holds asbestos-containing pipe-insulating material.

### 4.6 UNDERGROUND STORAGE TANKS

In 1986, the Navy registered five tanks with Ecology (Anderson 1995). The estimated capacities and ages of the tanks provided to Ecology were as follows: two 10,900-gallon tanks approximately 30 years old, one 23,200-gallon tank approximately 30 years old, one 48,000-gallon tank installed in 1982, and one 1,000- to 5,000-gallon tank estimated to be 20 to 30 years old. Mr. Sheldon, the boiler operator in 1989, indicated that all the tanks

HISTORICAL SURVEY, RESERVE CENTER, TACOMA U.S. Navy CLEAN Contract Engineering Field Activity, Northwest Contract No. N62474-89-D-9295 CTO 0200

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contaminated soils found in this area, additional water samples were collected and analyses indicated nondetected levels of TPH.

Tank 4, located next to Building 127, showed visual signs of leakage. The area was excavated until all signs of leakage were gone. Samples were collected from within the excavated area and the analysis indicated nondetected TPH levels. Analysis of the excavated soil indicated TPH levels exceeding cleanup levels. The contaminated soils were transported to Woodworth & Co. of Tacoma for disposal.

Tank 5 was located in the grassy area west of the administration building. Analysis of the samples collected from this area indicated TPH levels below cleanup levels.

The UST removal was completed in November 1993.

### 4.7 POLYCHLORINATED BIPHENYLS

In 1981, the Navy implemented procedures requiring facilities to file annual reports documenting the types and condition of PCB-containing materials on site. During the records search, several reports and letters were found regarding PCBs at the Reserve Center. One letter dated March 9, 1984, called for the disposal of a PCB-containing transformer. Annual reports for 1983, 1984, and 1985 reported a 939-kg PCB-containing transformer that was intact. A report dated January 1986 reported that the transformer was removed and disposed at an appropriate facility. It is unknown where this transformer was located. During the records review, no documentation regarding PCB spills was found (Gaines 1985; Hinojos 1983; Thomas 1986; White 1984; Williams 1984).

Fluorescent light fixtures are present in Building 51, Building 127, the administration building, and the shop buildings. It is unknown when these fixtures were installed; therefore, the ballast could contain PCBs.

### 4.8 OIL/WATER SEPARATOR

The oil/water separator system was used to process oily bilge water from ships docked at the Navy pier. The ships would pump their oily bilge water into a 2,000-gallon aboveground storage tank. The oily water was then pumped to a 25-gallon-per-minute three-stage, skidmounted oil/water separator. The separated oil was rerouted to a

HISTORICAL SURVEY, RESERVE CENTER, TACOMA U.S. Navy CLEAN Contract Engineering Field Activity, Northwest Contract No. N62474-89-D-9295 CTO 0200

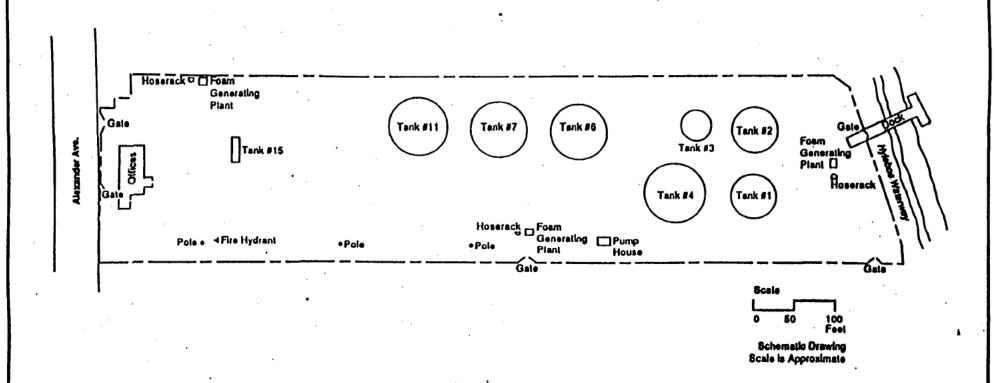
Section 4.0 Revision No.: 1 Date: 01/22/96 Page 4-7

2-year extension on the 1982 to 1984 variance were in the file. During the site visit on October 19, 1995, it was reported that the mock-shipboard fire training exercises had recently been canceled (Delanie 1995).

A woodworking shop located at the Reserve Center used several saws and sanders. Emissions were ducted to a low-efficiency cyclone particulate collector. A 1982 environmental engineering survey found no problems with emissions in these areas. It is unknown if the woodworking shop is still in operation.

All boilers historically and currently used have been permitted for emissions. A letter requesting completion of construction permit forms was located during the record review (Watters 1991). Because of this letter, it is assumed that the Navy completed the paperwork and received a construction permit for the current boiler facilities in 1991.

# Attachment 1b General Layout of AF POL Retail Distribution Station May, 1958, During DOD Useage.





# UST DECOMMISSIONING REPORT SITE ASSESMENT REPORT

CONTRACT No. 44255-93-C-4060 UST REMOVAL PROJECT NAVY RESERVE CENTER 1100 EAST ALEXANDER TACOMA, WASHINGTON

NOVEMBER 1993

PREPARED FOR:

ROICC/SILVERDALE

BUILDING 1009, NAVAL SUBMARINE BASE, BANGOR
SILVERDALE, WA. 98315-5000

PREPARED BY:

N.W.STRUCTION GENERAL CONTRACTING, INC.

22317 N.E. 72ND AVENUE

BATTLE GROUND, WA. 98604

(206) 687-2040

### ANALYTICAL RESULTS

### TANK T-3: 24,000 gallon

Two samples were obtained from native soils beneath this tank. Each sample was analyzed for WTPH-HCID. Analysis reports indicate non detect levels in accordance with current guidelines. No further action required.

### TANK T-2: 12,000 gallon

Two samples were initially analyzed for WTPH-HCID and WTPH-D methodology as required. Initial analyses documented high levels of TPH in soils (1980.3 ppm and 350.7 ppm). Additional excavation activities were then performed within this tank zone including removal of the former tank hold-down pad and further excavation below to excavate contaminated soils lying beneath. Upon completion of additional excavation activities, two additional soil samples were obtained for analysis from within the zone Laboratory analyses reports documents TPH levels at less than 100 ppm. These levels are below the current standard clean-up levels. The contaminated soils excavated were transported to Woodworth & Co. of Tacoma for disposal. Copies of the disposal receipts for these soils are enclosed in Appendix D. No further action required.

### TANK T1: 12,000 gallon

Two samples were obtained from native soils beneath this tank. WTPH-HCID analysis was performed on each of these samples. Analyses reports indicated non-detect levels of TPH. No further action required.

### TANK T-1X; 300 gallon

Tank T-1X was a 300 gallon UST that supplied heating oil to Building #51. Two samples were obtained and analyzed for WTPH-HCID, reports decumented non-detect levels of TPH. No further action required.

### SUMMARY

This report is based upon the decommissioning and removal of six UST's formerly known as T-1X, 1, 2, 3, 4, and 5 which were located at the Navel Reserve Facilities Training Center in Tacoma, Washington. All work was performed under Contract # N44255-93-C-4060. The observations, interpretations, and conclusions presented in this report are professional opinions based on the data described within. Conclusions are intended only for the purpose, site location, and project indicated and are specific to current site conditions.

Changes in the conditions of the subject property or changes in applicable standards which may occur with the passage of time, whether they result from natural processes, legislation, or the broadening of knowledge, may affect the conclusions offered in this report. Accordingly, the observations and findings presented in this report may be invalidated by changes outside of our control.

Soils within all areas consisted of QAF Alluvial Fan and associated deposits. All final analysis reports from samples within the tank excavation zones are below action levels. Contaminated soils encountered during the UST removal process, have been properly disposed of off-site at Woodworth & Co. in Tacoma, Washington. Based upon site observations, findings, and final analyses reports, this site may be considered a "clean closure", and no further testing or investigations associated with the tanks or ancillary piping are considered necessary at this time.

Enclosed in Appendix D are copies of the Washington State Department of Ecology Site Assessment Check list and Permanent Closure/Change in Service Checklists. Two copies of this report have been forwarded to the Underground Storage Tank Section of the WDOE in Olympia.

Respectfully,

Darry Becker

Registered Site Assessor



## PETROLEUM HYDROCARBON EVALUATION 721 ALEXANDER AVENUE Tacoma, Washington

October 27, 1995

# Prepared for:

Port of Tacoma, USA P.O. Box 1837 Tacoma, Washington 98401-1837

AGI Project No.:

14,809.004.06

Port Nos.:

PSA 957051; WO E1548

REC.



# PETROLEUM HYDROCARBON EVALUATION-95 NOV -2 A8:39 TACOMA, WASHINGTON

NW Riemoles, all Pull

### **EXECUTIVE SUMMARY**

The Washington Department of Ecology (Ecology) and the City of Tacoma (City) have noted oil entering the sanitary sewer line on Alexander Avenue. The Port of Tacoma property at 721 Alexander Avenue (Port site) and the adjacent PRI Northwest, Inc. property to the northwest (PRI site) have similar use histories involving storage and transfer of gasoline, jet, and diesel fuel. Ecology indicated oil entering the City of Tacoma sanitary sewer on Alexander Avenue is likely coming from the Port site, because the seepage appears to occur directly in front of it.

AGI's subsurface investigation at the Port site encountered stained soil containing total petroleum hydrocarbons (TPH), benzene, ethylbenzene, toluene, and xylenes (BETX) in monitoring well borings near Alexander Avenue. Two wells contain approximately 1 foot of light non-aqueous phase liquid (LNAPL). The soil and LNAPL have the characteristics of gasoline and diesel fuel. TPH-stained soil samples from four hand-auger borings near the center of the Port site have the characteristics of gasoline and heavy oil. TPH and chlorinated volatile organic compounds (VOCs) apparently have been reported on the PRI site.

Ground water is present in saturated sands at 6 to 7 feet below ground surface under unconfined, water table conditions. LNAPL is floating on the water table at this depth, which is close to the invert depth of the sanitary sewer beneath Alexander Avenue. Ground water in the shallow saturated sands apparently flows from the PRI site toward the Port site and may flow from the Port site toward the sanitary sewer.

TPH and BETX concentrations encountered on the Port site exceed Washington Model Toxics Control Act cleanup levels for soil and ground water. The central portion of the Port site has not been evaluated for the presence of VOCs. Chlorinated VOCs were not detected in shallow ground water near Alexander Avenue, although detection limits were elevated due to high associated TPH and BETX concentrations.

### 1.0 INTRODUCTION

### 1.1 General

This report presents the results of a petroleum hydrocarbon evaluation conducted by AGI Technologies (AGI) at 721 Alexander Avenue in Tacoma, Washington. This investigation was conducted for the Port of Tacoma (Port) in accordance with AGI's June 26, 1995 Revised Proposal as authorized by Port Work Order E1548.



### 3.0 HYDROCARBON DISTRIBUTION

### 3.1 Quality Control/Quality Assurance

Samples of LNAPL, soil, and ground water were submitted to Analytical Technologies Inc. (ATI) of Renton, Washington for analysis. Laboratory results were reviewed for quality control/quality assurance (QA/QC) by an AGI chemist. Laboratory analytical reports and associated QA/QC reports are enclosed in **Appendix C**. The data are of known quality and acceptable for use with the following qualifications:

The methylene chloride result for MW2 is considered not detected and flagged (U) due to laboratory contamination in the associated method blank. Methylene chloride is a common laboratory contaminant.

The surrogate spike recoveries are generally acceptable. However, in a few cases, percent recoveries exceeded ATI's control limits due to matrix interference or high levels of analytes in the samples. Other QC data (blank spike, blank spike duplicate, method spike, and method spike duplicate) were evaluated for these samples to confirm analytical accuracy, and no sample results were flagged on the basis of surrogate spike recoveries. The data meet the project objective of evaluating whether the target analytes are present at concentrations exceeding MTCA cleanup levels.

### 3.2 LNAPL

Light non-aqueous phase liquid (LNAPL) was encountered as free product floating on the water table in wells MW2 and MW4. Samples of LNAPL from these two wells were analyzed for specific gravity by ASTM Method D287 and were fingerprinted by 8015M; the WHCID results were inconclusive due to the high TPH concentrations present. The chromatograms indicate the hydrocarbons present are in the range of gasoline and diesel. Results are presented in **Table 2**. The measured ratio is 35 to 38 percent gasoline and 62 to 65 percent diesel, with no significant heavy oil fraction. The small amount of detected fuel hydrocarbons with longer carbon chains than C24 exhibit the characteristics of the heaviest fractions of diesel and jet fuel. The characteristic signature of heavy oil products, such as motor oil or bunker fuel, were not observed. The fingerprinting results are consistent with AGI's understanding of site history as a depot for military aviation fuel, as well as historic storage of gasoline on-site and on the adjacent PRI property to the northwest. This signature is also consistent with soil and ground water sample results collected from the monitoring wells, as described below.

### 3.3 Soil

Soil samples were analyzed for BETX by EPA Method 8020, for gasoline by WTPH-G, and for diesel and heavier hydrocarbons by WTPH-D Extended. Petroleum hydrocarbons are present from ground surface to near the water table in all monitoring wells except MW3



Table 3
Petroleum Hydrocarbons and BETX in Soil
Port of Tacoma / 721 Alexander Avenue
Tacoma, Washington

Sample or	Concentration in mg/kg						
Parameter	Parameter Diesel		Gasoline	Benzene	Ethylbenzene	Toluene	Xylenes
MW1 - 6 ft.	35000	ND <2300*	8300	36	60	35	190
MW2 - 6 ft.	12000	ND <2100*	4600	8.7	26	12	140
MW3 - 6 ft.	ND	ND	ND	ND	ND	ND	ND
MW4 - 6 ft.	9500	ND <2200*	4100	12	51	12	200
Detection Limit	12	49	6.2	0.031	0.031	0.031	0.031
HA1 - 3 ft.	420	1900	48	0.33	0.80	1.6	3.9
HA2 - 3 ft.	4100	8200	2700	13	26	35	110
HA3 - 2.5 ft.	500	1700	13	0.41	0.12	0.85	0.44
HA4 - 3 ft.	32	89	ИD	ND	ND	0.081	0.14
Detection Limit	12	49	5.2	0.026	0.026	0.025	0.025
Method	WTPH-D	WTPH-D ext	WTPH-G	8020	8020	8020	8020
MTCA Cleanup Level	200	200	100	0.50	20.00	40.00	20.00

### Notes:

- mg/kg = Milligrams per kilogram
- Samples collected July 11 and 12, 1995 by AGI personnel
- Analysis by Analytical Technologies Inc., Renton, Washington
- WTPH-D = Washington Dept. of Ecology TPH Method for Diesel (C12 C24)
- WTPH-D ext = Washington Dept. of Ecology TPH Method for Diesel, extended for C24 C34
- WTPH-G = Washington Dept. of Ecology TPH Method for Gasoline (C7 C12)
- MTCA Cleanup Level = Model Toxics Control Act Method A cleanup levels for soil (industrial values)
- ND = Not detected at the indicated detection limit
- \* = Increased detection limit, sample diluted due to high C12 C24 concentrations



Table 4
Petroleum Hydrocarbons and BETX in Ground Water
Port of Tacoma / 721 Alexander Avenue
Tacoma, Washington

Sample or	Concentration in mg/L						
Parameter	Gasoline	Diesel	Heavy Oil	Benzene	Ethylbenzene	Toluene	Xylenes
MW1	15	14	ND <3.9*	3.2	1	0.35	2.5
MW2	NA	NA _	NA	2.5**	0.36**	0.25**	2.0**
MW3	2.2	4.3	ND	1.4	0.075	0.044	0.12
MW4	NA	NA	NA	NA	NA	NA	NA
Detection Limit	0.1	0.25	0.75	0.0005	0.0005	0.0005	0.0005
Method	WTPH-G	WTPH-D	WTPH-D ext	8020	8020	8020	8020
MTCA Cleanup Level	1.0	1.0	1.0	0.005	0.030	0.040	0.020

#### Notes:

- mg/L = Milligrams per liter
- Samples collected July 14, 1995 by AGI personnel
- Analysis by Analytical Technologies Inc., Renton, Washington
- ND = Not detected at the indicated detection limit
- \* = Increased detection limit, sample diluted due to high diesel concentrations
- \*\* = Analyzed by EPA Method 8240, see Table 5 for complete results
- NA = Not analyzed because light non-aqueous phase liquid present in well as free product
- WTPH-G = Washington Dept. of Ecology TPH Method for Gasoline (C7 C12)
- WTPH-D = Washington Dept. of Ecology TPH Method for Diesel (C12 C24)
- WTPH-D ext = Washington Dept. of Ecology TPH Method for Diesel, extended for heavy oil (C24 C34)
- MTCA Cleanup Level = Model Toxics Control Act Method A cleanup levels for ground water

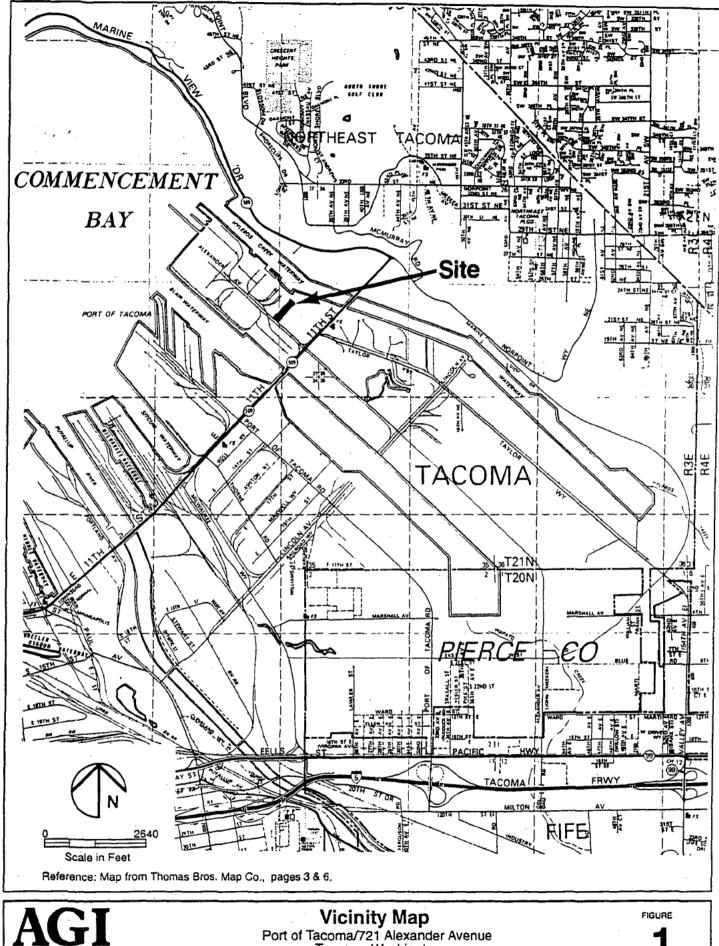


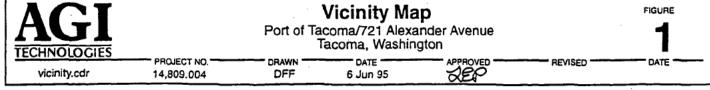
Table 5
Volatile Organic Compounds in Water by EPA Method 8240
Port of Tacoma / 721 Alexander Avenue
Tacoma, Washington

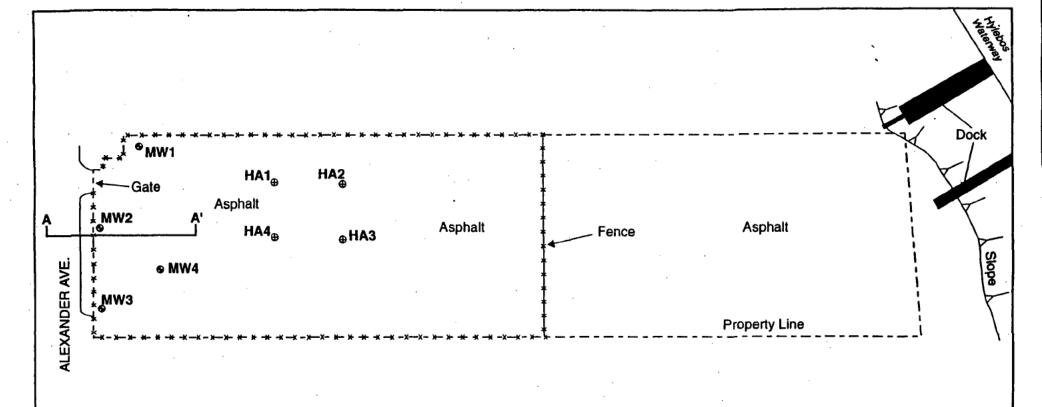
Compound	Concentration in ug/L					
	Detection Limit	Method Blank	MW2			
Acetone	10	ND	410			
Benzene	1	ND	1900			
Bromodichloromethane	1.	ND	ND <20*			
Bromoform	5	ND	ND <100*			
Bromomethane	10	ND	ND <200*			
2-Butanone (MEK)	. 10	ND	ND <200*			
Carbon Disulfide	1	ND	ND <20*			
Carbon Tetrachloride	1	ND	ND <20*			
Chlorobenzene	1	ND	ND <20*			
Chloroethane	1	ND	ND <20*			
Chloroform	1	ND	ND <20*			
Chloromethane	10	ND	ND <200*			
Dibromochloromethane	1	ND	ND <20*			
1,1-Dichloroethane	1	ND	ND <20*			
1,2-Dichloroethane	1	ND	ND <20*			
1,1-Dichloroethene	1	ND	ND <20*			
1,2-Dichloroethene (total)	1	ND ,	ND <20*			
1,2-Dichloropropane	1	ND	ND <20*			
cis-1,3-Dichloropropene	1	ND	ND <20*			
trans-1,3-Dichloropropene	1	ND	ND <20*			
Ethylbenzene	1	ND	350			
2-Hexanone (MBK)	10	ND	ND <200*			
4-Methyl-2-Pentanone (MIBK)	10	ND	ND <200*			
Methylene Chloride	5	3 (J)	ND (U)			
Styrene	1	ND	ND <20*			
1,1,2,2-Tetrachloroethane	1	ND	ND <20*			
Tetrachloroethene	1	ND	ND <20*			
Toluene	1	ND	200			
1,1,1-Trichloroethane	1	ND	ND <20*			
1,1,2-Trichloroethane	1	ND	ND <20*			
Trichloroethene	1	ND	ND <20*			
Vinyl Acetate	10	ND	ND <200*			
Vinyl Chloride	1	ND .	ND <20*			
Total Xylenes	1	ND	2000			

### Notes:

- ug/L = micrograms per liter
- Sample collected July 14, 1995 by AGI personnel
- Analysis by Analytical Technologies Inc., Renton, Washington
- ND = Not detected at the indicated detection limit (samples
- \* = Increased detection limit, sample diluted due to high diesel concentrations
- (J) = Estimated value (quantity is less than the method reporting limit)
- (U) = Analyte is considered not detected due to laboratory contamination found in the associated method blank





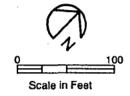


# **LEGEND**

HA2® Approximate Hand Auger location

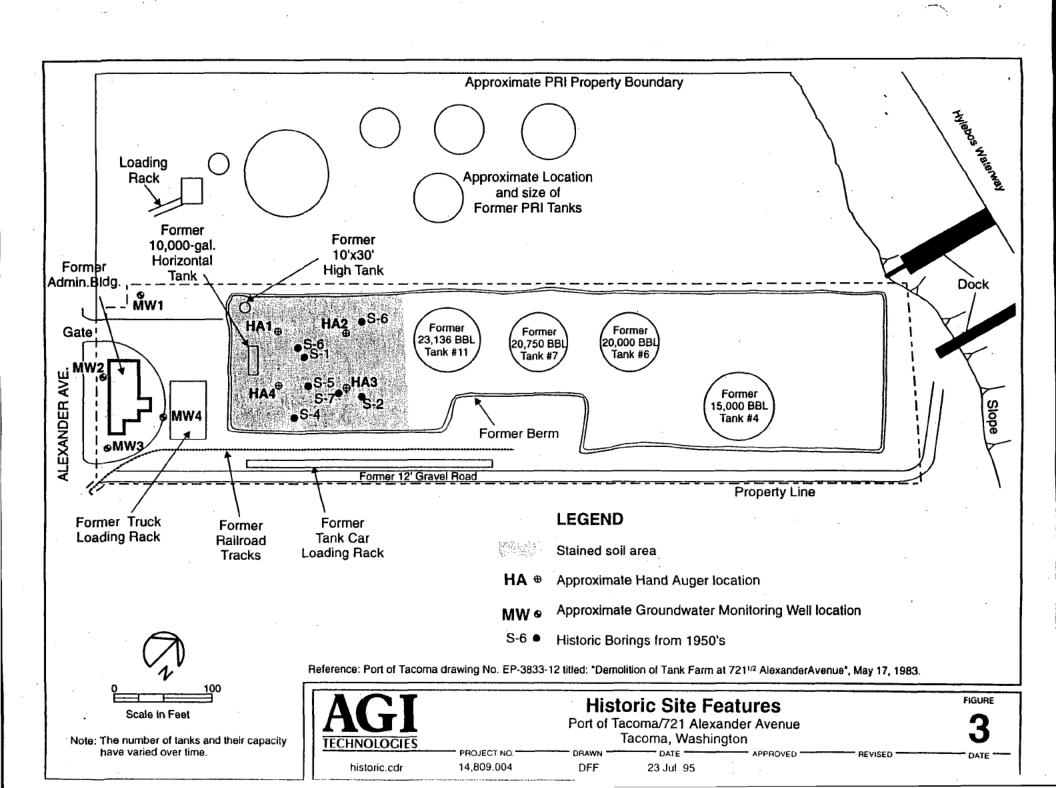
MW2. Approximate Groundwater Monitoring Well location

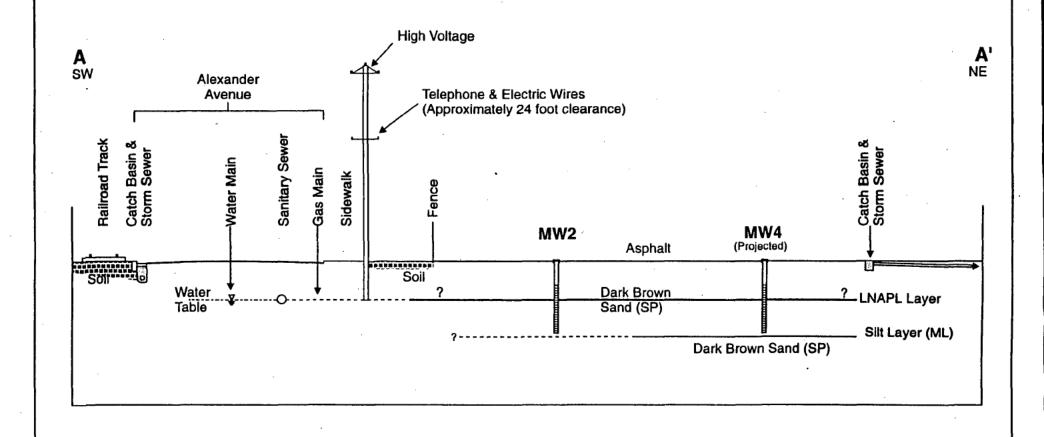
A Cross Section location



Reference: Port of Tacoma drawing No. EP-3833-12 titled: "Demolition of Tank Farm at 7211/2 AlexanderAvenue", May 17, 1983.

- 1							
١	ACT		Site Plan				
	TECHNOLOGIES		Port of Tacoma/721 Alexander Avenue Tacoma, Washington				2
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١	siteplan.cdr	14,809.004	DFF	23 Jul 95			

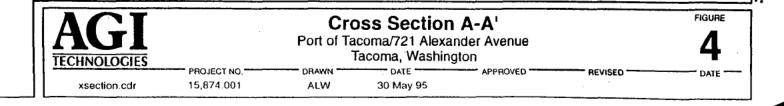


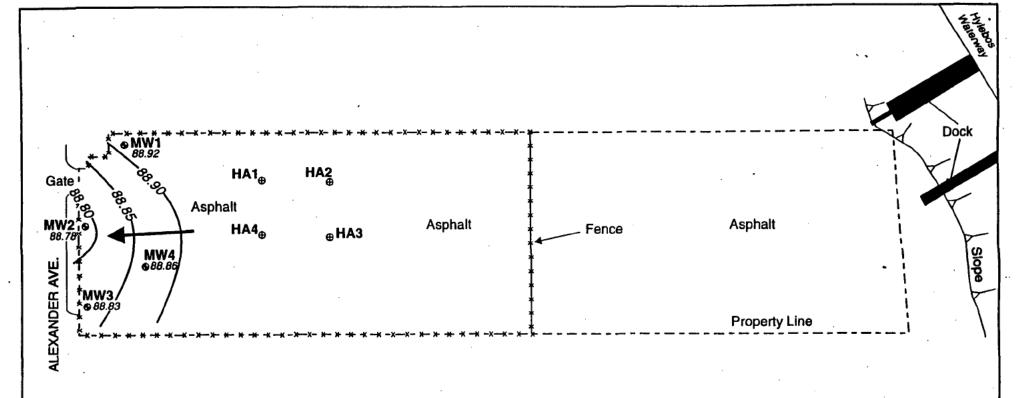


O 20
Horizontal & Vertical
Scale in Feet

No Vertical Exaggeration

Note: LNAPL = Light non-aqueous phase liquid





### **LEGEND**

Approximate Hand Auger location

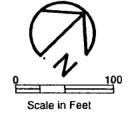
Approximate Groundwater Monitoring Well location, MW2<sub>©</sub> showing groundwater elevation in feet, taken July 14, 1995

Groundwater Contour elevation in feet, .05 interval

Inferred direction of groundwater flow

Note: Groundwater elevations in MW2 and MW4 were corrected for significant product thickness and should be considered approximate.

Reference: Port of Tacoma drawing No. EP-3833-12 titled: "Demolition of Tank Farm at 7211/2 AlexanderAvenue\*, May 17, 1983.



# **Groundwater Contour & Elevation Map**

Port of Tacoma/721 Alexander Avenue Tacoma, Washington

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**TECHNOLOGIES** 

PROJECT NO.

DATE 23 Jul 95

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FIGURE